DOCUMENT RESUME

ED 226 766 JC 820 481

AUTHOR Beachler, Judith Anne
TITLE Developing a Profile of the Continuing Education/Community Services Marketplace.
PUB DATE 12 Oct 82
NOTE 66p.; Paper presented at the National Conference of the National Council on Community Services and Continuing Education (Detroit, MI, October 10-13, 1982).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS College Planning; *Community Characteristics; Community Colleges; Community Education; *Community Services; *Enrollment Projections; *Enrollment Trends; Long Range Planning; Population Trends; Statistical Analysis; *Trend Analysis; Two Year Colleges
IDENTIFIERS *Community College of Allegheny County PA

ABSTRACT

An analysis is presented of the application of the Fiscal Trend Monitoring System (FISM) to community services/community education programs. First, background material describes the FISM as an approach to monitoring the financial condition of a county, city, township, or other governmental body with taxing capacity and explains how it may be adapted to the community services marketplace. Next, questions to be addressed in developing a profile of the community services market are considered in terms of market measurement and forecasting, market segmentation, and consumer analysis. The report then discusses the objectives and use of demographic trend analysis in plotting trends with different types of available data. Guidelines are then presented for collecting the necessary external (e.g., census) and internal (e.g., college) data and for developing community and enrollment profiles. Finally, an example of the use of the trend analysis system by the Community College of Allegheny County is provided, which includes an examination of the Allegheny County profile and its impact on projected enrollments; reveals trends in enrollment figures and their implications for the future; and explores the interrelationship between enrollment and county demography. Tables providing trend data for Allegheny County are presented. (HB)

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DEVELOPING A PROFILE OF THE

CONTINUING EDUCATION/COMMUNITY SERVICES MARKETPLACE

Presented By

Judith Anne Beachler
Director of Continuing Education
Community College of Allegheny County, Allegheny Campus
Pittsburgh, Pennsylvania

Tuesday, October 12, 1982

National Conference of the
National Council on Community Services and Continuing Education

Detroit Michigan

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I. ACKNOWLEDGEMENTS

Special notes of thanks are in order for three individuals who indirectly aided in the development of this system.

The first is Joseph A. James, Professor of Public Fiscal Management, U.S. Intergovernmental Relations and Revenue Administration in the Graduate School of Public and International Affairs at the University of Pittsburgh, Pittsburgh, PA. Professor James was the individual who imparted the knowledge and understanding of the use of the Fiscal Trend Monitoring System from which this system being presented was adapted.

The second person is Hector Correa, Professor Correa motivated me to master the basics of writing simple fortran programs and to master the use of the simple quantitative methods presented in this paper.

The third is Andrea Lex, Ph.D., Director of Institutional Research at the Community College of Allegheny County, Pittsburgh, PA, and her staff, who helped me with the collection of data.

II. BACKGROUND INFORMATION

This system which I am about to present was developed by adapting the Fiscal Trend Monitoring System (FISM). The FISM System was developed by Sanford M. Groves for the International City Management Association in 1980, as a practical approach for monitoring the financial condition of a county, city, township or other governmental body which has taxing capability.

The system being presented here could be further adapted to analyze demographic trends not only for the Community Services/Continuing Education (CS/CE) community based programs as I will explain, but also for daytime credit and professional continuing education programs as well. These analyses would require the development of indicators which are indicative of the business and economic community. A cash flow monitor system could also be designed by the Financial Management Department to analyze the interelationships between income, the budget and expenditures.

This system is particulary appropriate for analyzing the marketplace for Community Services and Community-Based Programs for a very specific reason. This market can literally be defined as all residents of adult age (CCAC'S defines this as age 16 and older) regardless of their level of education, age, sex, and socioeconomic status. This makes the analysis of the market as it actually exists in terms of its potential, much easier. Community demography as outlined by the U.S. Census Reports can be used with little or no "massaging" of the data. The degree programs and

professional continuing education programs do not have this same potential market, thus the census data must be "massaged" or other data sources, more difficult to obtain, must be used.

The question may rise in the minds of CE/CS managers as to the relevance of the techniques I will cover for her/him due to the fact that it is research. I believe it is relevant for the following reasons.

First, often the institutional research staff at a community college is small, understaffed and unable to conduct research which is so area-specific as continuing education. Generally, their research takes an overall College approach; when it becomes area specific, it is usually done so for the day credit program. This simple approach will give you the ability to conduct your own market profile.

Second, if the institutional research staff is available to serve your specific needs, then this information will give you the ability to assist the staff to ask appropriate questions which you have designed, based on your closer contact to the program and the people which you serve.

Third, regardless of the ability of the staff to lend support, it is my personal opinion that working with the data yourself, gives you the best understanding of the constituency you serve. Since you and your staff have the closest college contact with the people who enroll in the programs which you develop, your analysis of patterns probably has a better chance of being the most accurate.

III. INTRODUCTION: DEVELOPING A CONTINUING EDUCATION/COMMUNITY SERVICES (CE/CS) PROFILE OF THE MARKETPLACE THROUGH DEMOGRAPHIC TREND ANALYSIS

According to Philip Kotler in his recent publication Marketing for Non-Profit Organizations (Kotler, 1982), the job of analyzing the marketplace breaks into the following three major tasks:

1. MARKET MEASUREMENT AND FORECASTING: What is the current and future size of the available market for the College's CE/CS programs?
2. MARKET SEGMENTATION: What are the main groups making up the CE/CS market? What are the best target groups for us to serve? How does that portion of the market which the college's CS/CE department serve relate to the available market? What geographic locations are and or should be served? What is the demography of the locations (age, sex, race, income, social class)? What dominant multi-variable groups exist (persons by sex and by age; persons by age and by race, etc.).
3. CONSUMER ANALYSIS: What are the individual characteristics of the CE/CS consumers -- their needs, perceptions, preferences and behavior and how can the CE/CS program be adapted to the consumer characteristics?

This presentation will concentrate upon methods of "MARKET MEASUREMENT AND FORECASTING", and "MARKET SEGMENTATION" which give us a sociological understanding of the market. Consumer analysis gives one a psychological understanding -- what is the individual's needs, perceptions, etc. and will not be dealt with in this presentation. For those of you who are interested in some of the methods for consumer analysis, please check with me after the presentation for references.

IV. MARKET MEASUREMENT AND FORECASTING: WHAT IS DEMOGRAPHIC TREND ANALYSIS AND HOW DOES IT WORK?

As part of an overall strategic plan to map future directions for a department of continuing education, managers should analyze three basic questions: 1. What is the current market? (market definition): Who do we presently serve? 2. How large is the current market (current market size measurement) and 3. What is the likely future size of the market (market forecasting) i.e., based upon where we are, what new directions do we want to take? Understanding what the service constituency is, gives the manager the best available term of reference for decision-making in terms of new directions and goal setting. As resources decline, as markets and competition increase, using only a "shot gun" approach to new program development is not only inefficient in terms of the use of managerial time, but it could be extremely inefficient in terms of utilizing the college's fiscal resources as well as inefficient in its ability to generate income.

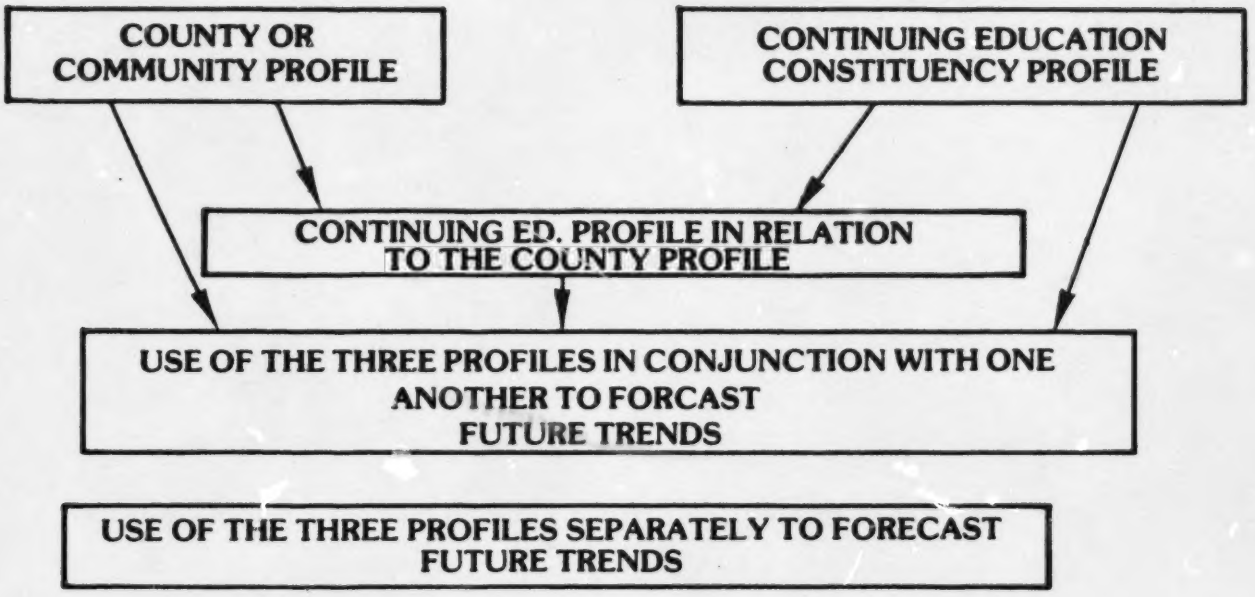
The demographic trend monitoring system being presented is designed to give the continuing education manager a practical approach to collecting data on existing programs and potential markets, to chart trends and to interpret results. By combining what is known about past enrollment patterns, in terms of demography of the community, the manager is then prepared to make some assertions in forecasting future enrollment patterns. This analysis allows the manager to establish new program directions with insight and forethought and thus developing a viable market advantage for the department.

Through trend analysis, three questions are addressed: 1. How did enrollment patterns act/vary in the past; 2. How might they vary or act in the future, based on past trends; and 3. What do the existing enrollment patterns look like in terms of the potential market, i.e. are there unserved markets available to us? By analyzing enrollment patterns over time, not only may fluctuations be explained, but future patterns may be predicted.

The purpose of the demographic trend monitoring system is to help a Department of Continuing Education/Community Services:

1. Make sense of the many factors that effect enrollment in a straightforward manner.
2. Develop quantifiable indicators where possible.
3. Use these indicators to gain a better understanding of enrollment patterns.
4. Use these indicators to identify emerging problems before they reach serious proportions.
5. Use these indicators to identify existing enrollment problems of which the department may not be aware.
6. Use these indicators to prepare a straightforward picture of the department's strengths and weaknesses.
7. Use these indicators to make enrollment projections.
8. Use these indicators and projections for budget building purposes.

TREND ANALYSIS CAN BE USED TO DEVELOP


COUNTY OR COMMUNITY PROFILE
CONTINUING EDUCATION CONSTITUENCY PROFILE
CONTINUING ED. PROFILE IN RELATION TO THE COUNTY PROFILE
USE OF THE THREE PROFILES IN CONJUNCTION WITH ONE ANOTHER TO FORCAST FUTURE TRENDS
USE OF THE THREE PROFILES SEPARATELY TO FORECAST FUTURE TRENDS

A. WHAT IS IT?

Trend analysis is actually time series analysis. Forecasts are prepared on the basis of a simple mathematical analysis of past data, with an assumption that patterns studied over time can give you the best possible information in predicting or forecasting patterns in the near future.

There are four major components to keep in mind when analyzing a time series of sales (in our case, enrollment in CE/CS program).

1. Trend: The basic level or rate of change in the size of a market.

2. Cycle: Periodic swings in general economic activity level of participation in terms of general business cycles. Example: The economy in the Pittsburgh area has declined rather dramatically over the last one and one-half years; unemployment has risen from 7.5% to 12.6%. Enrollment in the Allegheny Campus CE/CS Program changed as follows:

1979 - 1980	1980 - 1981	1981 - 1982
Est. 17% increase over 1978-79 figures	Est. 16% increase over 1979-80 figures	Est. 9% decrease from 1980-81 figures

What we do not yet know, however, is whether this would be considered a cycle or a sharp decline. Regardless, enrollment patterns in relation to changes in the economy seem quite evident.

3. Season: Consistent patterns of sales movements within the year. "Season" is used to describe any recurrent hourly, daily, weekly, monthly or quarterly sales pattern --could be related to weather factors, holidays, etc. Example: There is a consistent difference between the number of students CCAC, Allegheny Campus enrolls in its non-credit program in the fall and winter semesters. Enrollment in the winter semesters is consistently larger than the enrollment in the fall semesters.

4. Erratic Event: Strikes, blizzards, fads, riots, fires, etc. Example: Disco Dance--almost 30 percent of the Allegheny Campus' enrollment was in disco dance. The second fad was aerobic dancing. Both affected enrollment considerably, the second shortly after the interest in first had died.

B. HOW DOES IT WORK?

I intend to review two very simple methods of calculating the points of a trend line.

The first method I will present is the least squares method. Statisticians place the following limitations upon its use.

1. This method assumes a normal curve.
2. This method assumes a random distribution.

If you know little about the origin of your data, the second method, which is a recurrent process using moving averages should be used as it does not make these assumptions. In addition, for this second process, a very simple fortran program can be written which enables you to call upon the talents of a computer to do the necessary calculations far more expeditiously. Even simpler to utilize is the Box-Jenkins analyses of time series which is an option available through the SPSS packaged program; its advantage is that it will physically graph the trend line for you. Information regarding both the fortran program and the SPSS system can be made available to anyone interested. Please check with me at the end of this presentation.

CALCULATING AND PLOTTING A TREND LINE USING LEAST SQUARES METHOD

The CE/CS Enrollment in the City of Pittsburgh

The object is to calculate a trend line for enrollment for a time series of three fiscal years: 1978-1979, 1979-1980 and 1980-1981. In practice, a longer period should actually be used; plot the trend line along with the actual data; and project the trend line for fiscal years 1981-1982 through 1983-1984. This example represents the procedure when data is available for an odd number of years (three in this particular case).

Step I

A. Fiscal Year	B. Annual Enrollment	C. Years From Central Year	D. Cross-Products (B) x (C)	E. Years-Squared (C) x (C)
1. 1978-79	10,687	-1	-10,687	1
2. 1979-80	12,550	0	0	0
3. 1980-81	14,518	-1	+14,518	1
Total	37,755		3,831	2

Step 2

Calculate the slope:

$$\text{Slope} = \frac{\text{cross-products total (D)}}{\text{years squared total (E)}} = \frac{3,831}{2} = 1,915.5$$

Step 3

Calculate the level in the central year:

$$\text{Level in central year} = \frac{\text{total enrollment}}{\text{number of years}} = \frac{37,755}{3} = 12,585$$

Step 4

Calculate the trend line and project the trend line to fiscal year 1983-84:

Fiscal Year	Level in Central Year		Number of Years from Central Year		Slope		Trend Line Value
1. 1978-79	12,585	+	(-1	x	1915.5)	=	10,699.5
2. 1979-80	12,585	+	(0	x	1915.5)	=	12,585.0
3. 1980-81	12,585	+	(+1	x	1915.5)	=	14,500.5
4. 1981-82	12,585	+	(+2	x	1915.5	=	16,416.0
5. 1982-83	12,585	+	(+3	x	1915.5	=	18,331.5
6. 1983-84	12,585	+	(+4	x	1915.5	=	20,247.0

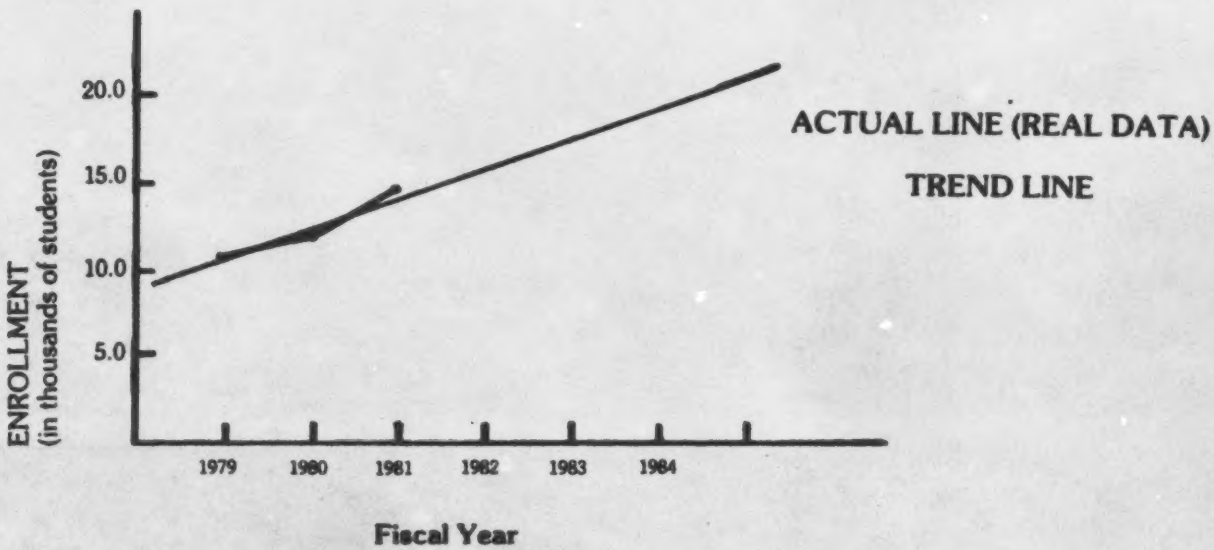
Step 5

Graph the time series and the trend line.

PROFILE: Continuing Ed. Constituency
Allegheny Campus, CCAC

INDICATOR BEING STUDIED:
Total Annual Enrollment

CALCULATED WITH ACTUAL DATA KNOWN FOR AN ODD NUMBER OF YEARS



CALCULATING AND PLOTTING A TREND LINE USING LEAST SQUARES METHOD WHEN THE DATA FOR AN EVEN NUMBER OF YEARS IS KNOWN

For an even number of years (four in this particular case)
Calculating a trend line for an even number of years is similar except that the "central year" is between the two central years. For these two central years, the trend-line values are calculated by adding or subtracting half the value of the calculated slope to or from the calculated "level in the central year".

Step 1

A. Fiscal Year	B. Annual Enrollment	C. Years From Central Year	D. Cross-Products (B) x (C)	E. Years-Squared (C) x (C)
1. 1978-79	10,687	-1	-10,687	1
2. 1979-80	12,550	0	0	0
Central Year				
3. 1980-81	14,518	0	0	0
4. 1981-82	13,163	+1	+13,163	1
Total	50,918		2,476	2

Step 2

Calculate the slope:

$$\text{Slope} = \frac{\text{cross-products total (D)}}{\text{years squared total (E)}}$$

$$\text{Slope} = \frac{2,476}{2} = 1,238.;\ 1/2 \text{ the value of the slope} = 1,238/2 = 619$$

Step 3

Calculate the level in the central year

$$\text{Level in "central year"} = \frac{\text{total enrollment}}{\text{number of years}} =$$

$$\text{Level in "central year"} = \frac{50,918}{4} = 12,729.5$$

Step 4

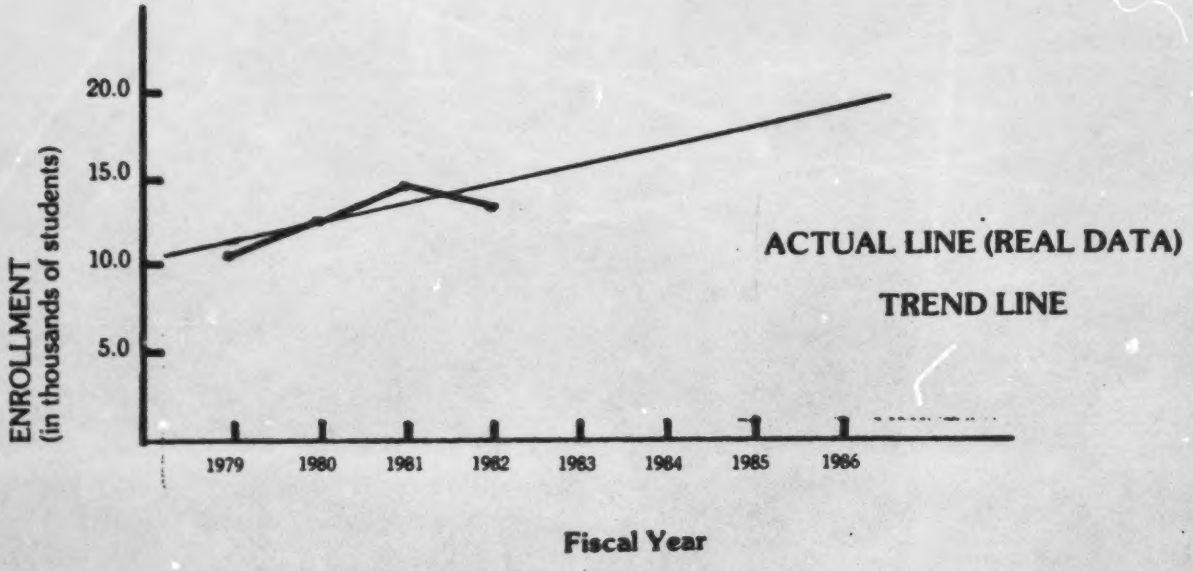
Calculate the values of the trend line and project trend line to Fiscal Year 1983-84.

Fiscal Year	Level in Central Year	Number of Years from Central Year	Slope	Trend Line Value
1. 1978-79	12,729.5 +	(-1 x	1238) =	11,491.5
2. 1979-80	(12,729.5-619)+	(0 x	1238) =	12,110.5
3. 1980-81	(12,729.5+619)+	(0 x	1238) =	13,348.5
4. 1981-82	12,729.5 +	(1 x	1238) =	13,967.5
5. 1982-83	12,729.5 +	(2 x	1238) =	15,205.5
6. 1983-84	12,729.5 +	(3 x	1238) =	16,443.5
7. 1984-85	12,729.5 +	(4 x	1238) =	17,681.5

Step 5

Graph the time series and the trend line.

CALCULATED WITH ACTUAL DATA FOR AN EVEN NUMBER OF YEARS



CALCULATING AND PLOTTING A TREND LINE USING A RECURRENT PROCESS WITH MOVING AVERAGES

x_t = Known enrollment for a certain number of previous years (2, 3, 4 or however many years of data are known.

A_1 = 1/# years of known enrollment. (actual and/or forecasted)

$X_t + 1 = A_1 X_t$ where X_t+1 = The forecasted value for the succeeding year (s).

Example #1: 3 years of total annual enrollment are known. You wish to forecast enrollment for the 4th and 5th years using these three years of data, making the assumptions that (a) a constant proportion (A) is appropriate and that (b) more of the three years of enrollment reflect "seasonal" "cyclical" or "erratic events".

CE/CS ANNUAL ENROLLMENT CCAC, ALLEGHENY CAMPUS		
YEAR	t (year #)	Enrollment
1978-79	1	10,687
1979-80	2	12,550
1980-81	3	14,518

$X_t + 1 = A_1 X_t$

$X_{year\ \#4} = 1/3\ (10,687 + 12,550 + 14,518) = 37,7550/3 = 12,585.$

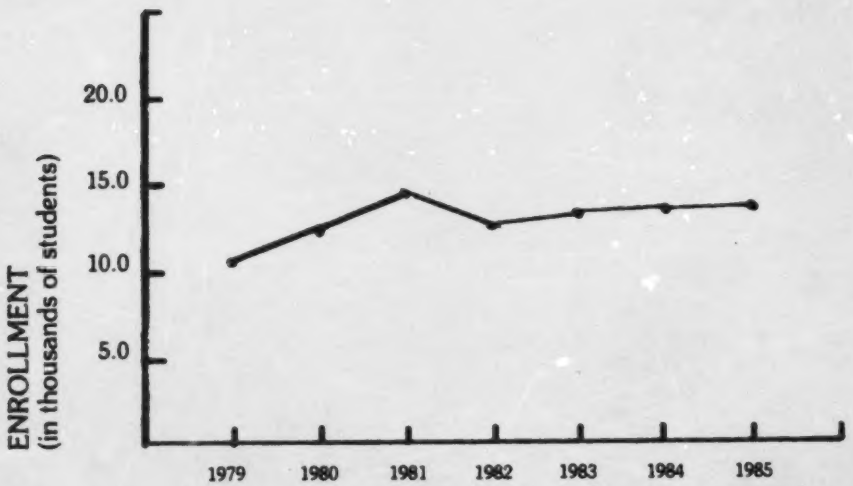
$X_{year\ \#5} = 1/3\ (12,550 + 14,518 + 12,585) = 13,217.67.$

GRAPH THE KNOWN AND FORECASTED ENROLLMENT FIGURES.

PROFILE: Continuing Ed. Constituency
Allegheny Campus, CCAC

INDICATOR BEING STUDIED:
Total Annual Enrollment

CALCULATED WITH ACTUAL DATA AVAILABLE FOR A THREE YEAR PERIOD



ACTUAL DATA

FORECASTED DATA

CALCULATING AND PLOTTING A TREND LINE USING A RECURRENT PROCESS WITH FLOATING AVERAGES

Example #2: 4 years of total annual enrollment are known. You wish to forecast enrollment for the 5th, 6th and 7th year, making the same two assumptions as listed above.

CE/CS ANNUAL ENROLLMENT, CCAC, ALLEGHENY CAMPUS

YEAR	t (year #)	Enrollment
1978-79	1	10,687
1979-80	2	12,550
1980-81	3	14,518
1981-82	4	13,163

$X_t + 1 = A_c X_t$

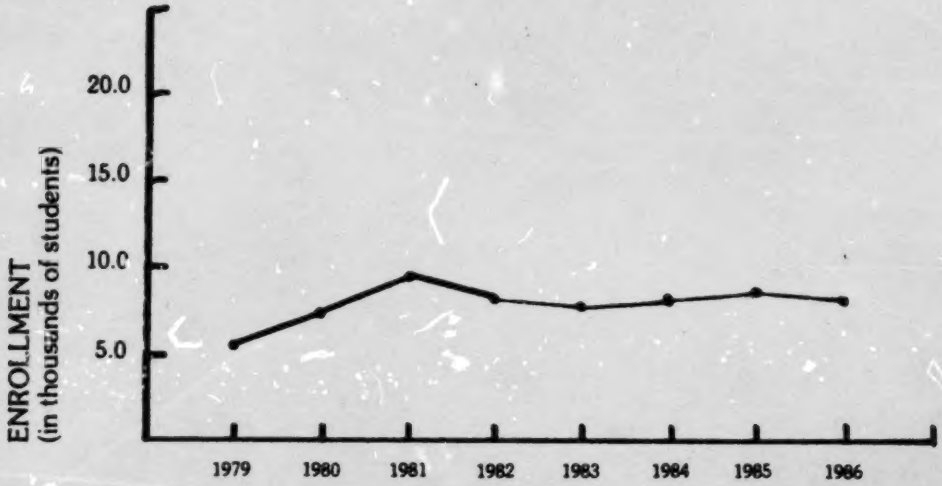
$X_{year\ \#5} = 1/4\ (10,687 + 12,550 + 14,518 + 13,163) = 12,729.5$

$X_{year\ \#6} = 1/4\ (12,550 + 14,518 + 13,163 + 12,730) = 13,240.0$

$X_{year\ \#7} = 1/4\ (14,518 + 13,163 + 12,730 + 13,240) = 13,412.0$

GRAPH THE KNOWN AND FORECASTED ENROLLMENT FIGURES.

CALCULATED WITH ACTUAL DATA AVAILABLE FOR A FOUR YEAR PERIOD



ACTUAL DATA

FORECASTED DATA

V. GUIDELINES FOR COLLECTING THE NECESSARY DATA

A. An external source of data to obtain a Community Profile is the U.S. Census, as it breaks down to county, city, municipality. City breakdowns by neighborhoods have also been analyzed by City Planning Departments. This is an excellent source for data.

U.S. Census Data includes the following general information on local demographics:

Sex, marital status, race, age, median age, median income.

Other available information includes the following:

A. Social Characteristics

Years of school completed
Occupational group
Level of education
State/County of birth (ethnicity/enclave identification)
Ancestry (migration pattern)
Veterans status
School or college enrollment/public or private
Presence of disability or handicapped

B. Economic and Financial Characteristics*

Industry, occupation, class of work
Employment status
Income and media income
Means of transportation to work
Mortgage vs. rental information
Property value

*Economic information that is collected on families (income, etc.) is available in the U.S. Census Population and/or Census Data. There is also an Economic Census Series published every five years (1972, 1977, 1982, etc.) which gives information on retail trade, wholesale trade governmental activity, service industry by geographic/area.

C. Housing

Occupancy characteristics
Structural characteristics (age, #units of address, etc.)
Years in household
Vacancy rate

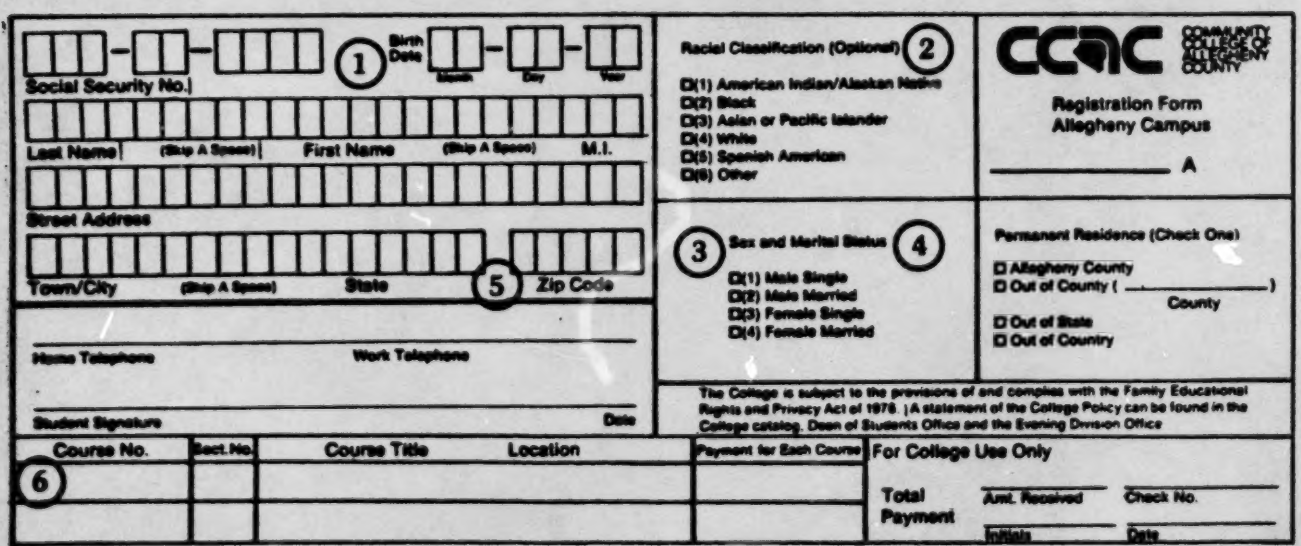
D. Other Types of Information and Sources:

In Pittsburgh, a bibliography entitled Datafinder: Housing and Socioeconomic Data Sources for the Pittsburgh Area was published cooperatively by the Housing Information Center of ACTION Housing, Inc., a United Way Agency, and the University of Pittsburgh Center for Social and Urban Research in January, 1982. This guides individuals to demographic information of Southwestern Pennsylvania compiled by approximately 30 institutions, including compilations by cities, states and Federal Government bodies; colleges/universities; private non-profit and commercial data banks, such as information systems companies; socioeconomic consultant research firms; banks; and credit unions. As this report indicates, much of the Census data is utilized to compile more "area specific" demography for a given locality. Samples of the kind of information that is available include:

Business activity
Economic geography and land use
Recipients of public assistance
Employment base
City development (neighborhood capital projects)
Public facility inventories (school, fields, parks, recreation centers, etc.)
Residents and residence by zipcode (market by direct mail co.'s and sometimes city planning departments)
Tax rates and assessments
Employment projections
Economic forecasts

B. INTERNAL SOURCES

The form below is a copy of the registration form used at the Community College of Allegheny County for non-credit professional continuing education and non-credit adult education.



1. Birthdate/Age
2. Race
3. Sex
4. Marital Status
5. Zip Code
6. Course Number Catagorized by Subject

C. PROFILES

Some excellent information is collected which can be used to analyze aggregate demography of your service area or community over time. It is important to code and analyze this data in the same format as one can analyze U.S. Census data so that you can develop: (a) the community profile; (b) the enrollment profile; and (c) the relationship of the enrollment profile to the community profile. It is this information which gives you an understanding of the market which you actually serve and whether there are areas of your potential market which you are not yet serving at all.

Information on College Form Enrollment Profile	County or Community Profile U.S. Census Data Classification
1. Birthdate/Age	1. Age: Categorize College Data in same manner; collapsis Census Data categories to agree with College Data.
2. Racial Classification	2. 14 classifications which must be collapsed to agree with the 6 College classifications.
3. Sex	3. Same.
4. Marital Status	4. Same.
5. Zip Code	5. Same; *Data must be "massaged" (often has been done by City and/or County Planning; also available through National Marketing by Mail Forms).

Additional Ways of Analyzing Same Information	County or Community Profile U.S. Census Data Classification
1. Persons by sex and by age.	1. Same.
2. Persons by age by race.	2. Same.
3. Persons by sex by race.	3. Same.
4. Median age by race.	4. Same.
5. Median age by sex.	5. Same.
6. Persons by sex by marital status.	6. Same.
7. Persons by age by marital status.	7. Same.
8. Any of the above in terms of zip code to add geographic location to analysis.	8. Data must be "massaged" or obtained from Marketing by mail company.
9. Enrollment by course type, analyzed separately and/or in terms of data listed above.	9. Data must be "massaged".

Information missing from the CCAC form which would allow for extremely valuable analyses includes:

1. Level of education completed to date.
2. Income information.

CCAC, like most other institutions, has numbered its courses by category. This is extremely valuable in analyzing the popularity of subject areas to various groups. Course categories were developed by CCAC System-Wide Task, one Community College representative from each Campus, as these individuals work closest to the total curriculum.

Our Classification is as follows:

A. Academic Courses

- a. Business Education
- b. Communication
- c. Humanities
- d. Language
- e. Math
- f. Natural Science
- g. Pre-College
- h. Social Science
- i. Technical/Vocational
- j. Law
- k. Education
- z. Workshops

B. Craft/Hobby

- a. Animals
- b. Crafts
- c. Fiber Arts
- d. Games
- e. Hobbies and Collectibles
- f. Photography/Camera
- g. Metaphysics
- z. Workshops

C. Home Related

- a. Consumer Education
- b. Energy
- c. Family Relations
- d. Food & Drink
- e. Maintenance
- f. Sewing
- g. Woodworking
- h. Financial
- i. Landscape/Garden
- z. Workshops

D. Performing Arts

a. Art
b. Dance
c. Music
d. Theatre
z. Workshops

E. Personal Development

a. Interpersonal Skills
b. Self-Related Skills
z. Workshops

F. Physical Fitness/Sports/Health Courses

a. Fitness
b. Group Sports
c. Health and Safety
d. Individual Sports
z. Workshops

G. Professional Continuing Education Courses

a. Small Business
b. Nursing
c. Health
d. IRS
e. Management
f. Professional Continuing Education Courses
y. Miscellaneous
z. Workshops

H. Technical Continuing Education Courses

a. Journeymen

I. Transportation Courses

a. Air
b. Auto/Motorcycle
c. Rail
d. Self-Propelled
e. Water
z. Workshops

J. Special Population Courses

a. Aged
b. Gifted
c. Handicapped
s. Workshops

K. Community Concerns

These courses can be analyzed in a similar manner, as was previously described. What is the age, racial composition, residence, sex, of students taking a particular category of courses? This may prove to be an extremely valuable analysis. For example, you learn that a very high percentage of students who enroll in your performing art courses are women between the ages of 25 and 35; you also realize that a high percentage of these individuals live in one location/zipcode. In addition, you learn through your analysis that similar demographic characteristics exist in another neighborhood which you are not yet serving. This may therefore be an indication that you are not marketing your program appropriately, or that you have another market for performing art courses. You may also gain an indication of types of courses to market more vigorously in certain areas, based upon their previous ability to draw enrollment.

VI. DEMOGRAPHIC TREND MONITORING/FORECASTING SYSTEM

A. Least Squares Method --
   Trend Worksheet
   Graph Worksheet

B. Forecasting a trend using the Recurrent Process with Moving Averages --
   Trend Worksheet
   Graph Worksheet

TREND WORKSHEET | USING LEAST SQUARES METHOD

Profile: _____ **Indicator Being Studied:** _____

	Description of Indicator	DATA				
		19___	19___	19___	19___	19___
1						
2						
3*						

*3 is often calculated to indicate 1 as a percentage of 2, particularly when one wishes to analyze enrollment patterns in terms of county or community demography.

A. Fiscal Year	B. Calculations of Indicator	C. Years from Central Year	D. Crossproducts	E. Years Squared
19___				
19___				
19___				
19___				
19___				
TOTAL				

$$\text{Slope} = \frac{\text{cross-products total (D)}}{\text{Years squared total (E)}} =$$

$$\text{Level in Central Year} = \frac{\text{total (B)}}{\text{\# of years}} =$$

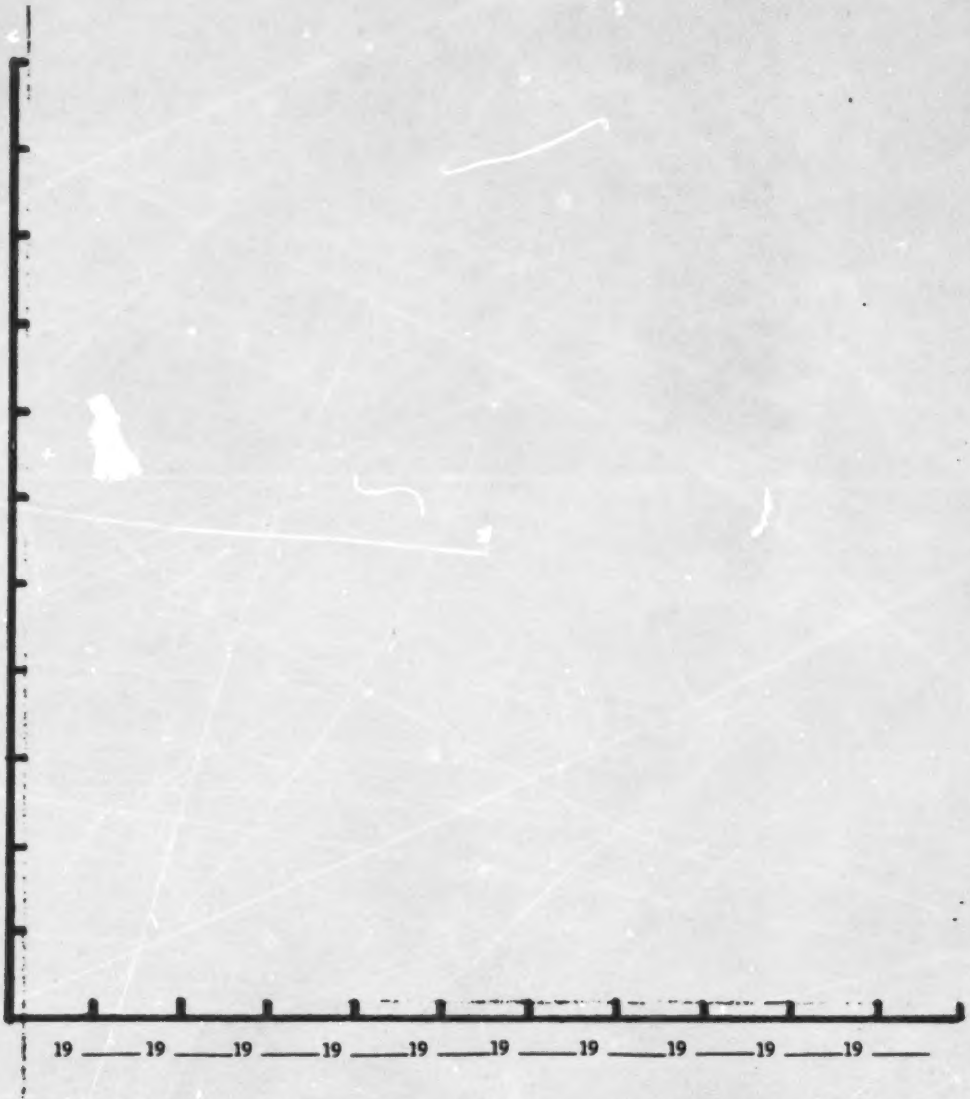
Calculating Trend Line Value

Fiscal year	Level In Central Year		# of Years From Central Year		Slope		Trend Line Value
19___		+	(	x		)	=
19___		+	(	x		)	=

GRAPH WORKSHEET -- LEAST SQUARES METHODS

PROFILE _____

INDICATOR BEING STUDIED_____



ACTUAL LINE

TREND LINE

WORKSHEET	TO FORECAST TREND, USING
RECURRENT PROCESS WITH MOVING AVERAGES	

Profile: _____ **Indicator Being Studied:**

_____

_____

	Description of Indicator	DATA				
		19____	19____	19____	19____	19____
1						
2						
3*						

*3 is often calculated to indicate 1 as a percentage of 2, particularly when one wishes to analyze enrollment patterns in terms of county or community demography.

Year	t, (the year's number)	x, calculation of indicator
19____		
19____		
19____		
19____		
19____		
19____		

A ; = 1 divided by the number of years of known enrollment (actual and/or forcasted). This figure remains the same throughout the process.

$X_t + 1 = A j X t$

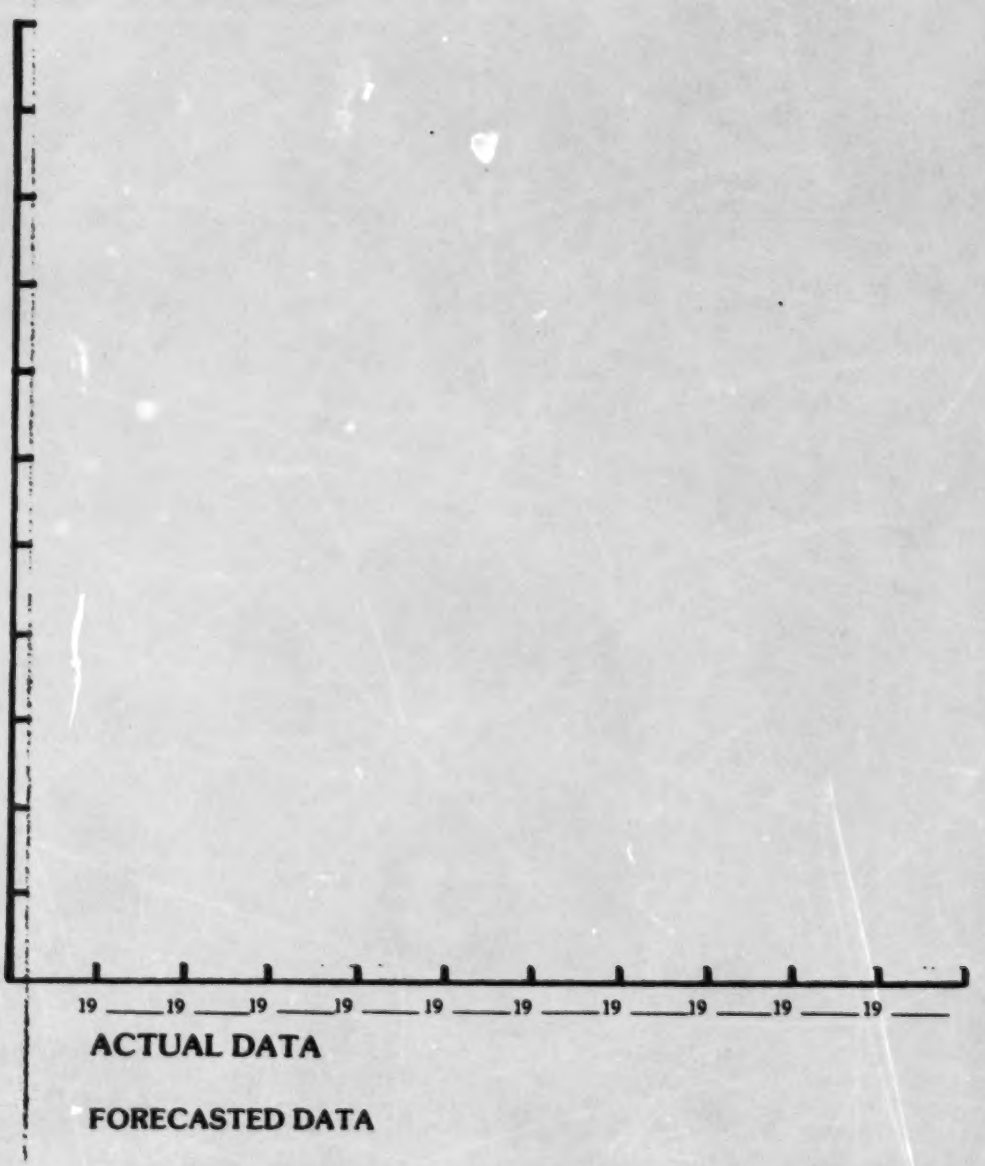
$X_{t+1} = A j(X t + X t\text{-}1 + X t\text{-}2 \ldots\ldots X t\text{-}n)$

X year # _____ =
X year # _____ =
X year # _____ =
X year # _____ =
X year # _____ =

GRAPH WORKSHEET USING A RECURRENT PROCESS

WITH MOVING AVERAGES

PROFILE _____ INDICATOR BEING STUDIED_____



VII. USING THE TREND ANALYSIS SYSTEM

The following analysis is sketchy and will need to be revised for the following reason. First, the final 1980 Census Data has not yet been released. There is, however, some very limited preliminary data available for analysis. It is this preliminary data that was used for my analysis. Internal statistics were not available for the non-credit continuing education/community service program so the analysis which I will review is of the credit program for Fall semesters. As I mentioned in the review of trends, cycles, seasonal fluctuations and eratic events, it is important to guard against analyzing statistics that are not "alike". For example, if Winter semesters generally enroll more students than your Fall semesters, than you should not analyze them in terms of each other. I therefore selected four Fall semesters for this sample analysis.

When using this system to analyze the credit program, we must be careful that the same assumptions are not made about the potential markets for credit students that are made for the market for non-credit students. One could make the assumption that community-based programs have the potential of appealing to all residents, 18 and older, regardless of where they live, their income, their race, level of completed education, etc. The same assumption probably cannot be made of the potential market for credit programs.

The credit program can, however, be analyzed in terms of the county

profile as a percentage. If you see for example, that an analysis of the enrollment as a percentage of county population remains relatively constant, over a long period of time (say for example, a 10-year period), then if it drops drastically, you have great cause for concern. An on-going analysis using this system or a similar one should however give you a strategic advantage because you know your existing market and your market potential.

A. WHAT IS THE COUNTY/COMMUNITY PROFILE: SAMPLE PROFILE OF ALLEGHENY COUNTY

Demography of Allegheny County is changing, but the changes are clearly more substantial in residents under 18 years of age rather than those 18 and older. The analysis outlined by graph #A-1 indicates that the drop in population for our market is very slight.

The County population, overall, has decreased by 10.7 percent; the population of residents age 18 and older has declined by 4.7 percent.

Graph #A-2 clearly indicates that the population of this County is aging. Adults age 18 and older made up 71.2 percent of the population in 1978; this same age category made up 72.5 percent of the population by 1981.

I now plan to analyze a segment of the adult population which I will later analyze in terms of CCAC enrollment and that is residents between the ages of 18 and 22. The total population, ages 18 to 22 has declined but very slightly, as indicated by graph #A-3.

The male population, ages 18 to 22 has declined even so slightly. The female population has declined at a higher rate as graph #A-3 and #A-4 indicate.

The change in census figures from 1970 to 1980 indicate that there has been a decline in the number of males ages 18 to 22 by 19.5 percent; there was a decline of the number of females by 33 percent. What this means is that the number of female babies (as percentage of children born) born in 1958-1962 was substantially less than the number of female babies born from 1948 to 1952. Analyzing this information prompted me to analyze how it may impact upon the number of women enrolled in this age group at Community College. Indications for this follow in the next section.

Before projections on patterns of the number of 18 to 22 year olds are taken too seriously, it's important to at least look at, if not forecast, data on the 13 to 17 year olds. It is this group that will be 18 to 22 years of age when your projection become realities.

B. WHAT IS THE ENROLLMENT PROFILE: SAMPLE PROFILE OF COMMUNITY COLLEGE OF ALLEGHENY COUNTY (CCAC) SYSTEMWIDE ENROLLMENT USING DATA FOR FOUR CONSECUTIVE FALL SEMESTERS 1978-1982

A look at total enrollment figures (graph #B-1) shows us that enrollment figures remained rather constant from 1978 to 1979; they increased very slightly in 1980 and decreased by approximately 1,120 students from 1980 to 1981. It was this information which prompted me to try to locate where the enrollment decline may have occurred. This becomes clearer as we break the enrollment figures into segments.

A breakdown of the percentage of total enrollment indicates that there was a decline through 1980 and a rise from 1980 to 1981 (graph #B-2). A similar analysis (graph #B-3) of the percentage of enrollment that is female indicates an increase of 2.5 percent from 1978 to 1979, a decrease of 2.1 percent from 1979 to 1980 and an increase of 2.7 percent from 1980 to 1981. By 1981, 53.1 percent of the student enrollment in credit courses was female; men made up 45.8 percent. We have had one very poor year of data reporting (1980) when almost 10 percent of the students enrolled did not report their sex, thus analysis is thrown off slightly. It does, however, still raise the need for further breakdown by age and by sex together to further define the market we serve.

Since 18 to 22 years of age has been considered to be the traditional age of college students, I next chose to use this group for the analysis, particularly when a brief glance at day enrollment indicates that between 60 percent and 70 percent of this constituency is in this age group.

Graph #B-4 shows us a very interesting pattern. Enrollment of 18 to 22 year olds from 1978 to 1980, as a percentage of total enrollment declined slightly. However, from 1980 to 1981 there was a very sharp increase in enrollment, from 34.6 percent to 48.1 percent which suggests that we ask a few questions. An analysis of inflation, both nationally and locally indicated that we may have hit either a "cycle" or an "eratic event" in the Pittsburgh area. Inflation hit most families; in addition, unemployment affected a substantial number of people. The unemployment rate in the Pittsburgh Standard Metropolitan Area was 7.5 percent in April 1981; it rose to 11.0 percent by April of 1982 and is now 12.6 percent. The Fall semester of 1981 is the first major rise for student enrollment ages 18 to 22. It may be that as money becomes scarce, more "traditional college age students" are choosing community colleges over four year institutions for the first two years of their education for financial reasons. This graph which indicates that enrollment for ages 18 to 22 increased, coupled with this graph, which indicates that overall enrollment (expressed as raw data) had declined, prompt further analysis to see where the overall decline may have occurred.

A look at graphs #B-5 and #B-6 together indicate some similar patterns in the 18 to 22 year old age group. The decline and rise of enrollment by sex in this age group as a percentage of total enrollment of each sex are similar, though from 1978 to 1979 the decline in the number of women enrolled is sharper (from 37.7 percent to 33.9 percent). Similarly, the increase in men, ages 18 to 22 as a percentage of total enrollment of men is much higher (from 39.2 percent to 45.8 percent). The forecasts indicate that if the

patterns from 1978 through 1981 continues over the next five years the percentage of women and men ages 18 to 22 enrolled in credit courses will prove to be 51.8 percent of the women enrolled, and 45.5 percent of the men enrolled.

A word of caution about this interpretation. We do not know whether this enrollment change from 1980 to 1981 is a "erratic event" or the start of a new trend.

If the theory mentioned previously about the local economy is true, we may find a continued increase in enrollment of 18 to 22 year olds. This has implication for student service personnel as well as for the management staff of the admissions office.

Since the 18 to 22 year old may be easier to recruit, we may wish to pull back on the concentrated recruitment effort of this group and initiate a more concerted effort for groups which seem more difficult to recruit. Again, as the first graph indicates, we are losing total enrollment (slightly) somewhere. The next few analyses may indicate where that is occurring.

I next analyzed patterns in the day enrollment and evening enrollment separately. Graph #B-7 shows us that day enrollment has increased slightly each year from 1978 to 1980 with a larger increase from 1980 to 1981 (an increase of approximately 528 students vs. an increase of approximately 122 from 1978 to 1979, and an increase of 183 from 1979 to 1980). Day enrollment in terms of headcount has increased slightly as graph #B-7, just discussed, indicates. Graph #B-8 shows us, however, that as a percentage of total

enrollment, it increased quite substantially from 1980 to 1981. Since day enrollment rose, yet overall enrollment declined slightly we can surmise that a substantial drop occurred in evening enrollment. However, before leaving the analysis of the day enrollment, a quick look at the 18 to 22 year olds during the day indicates some interesting patterns. We will take a look at the analysis of evening enrollment shortly.

The number of 18 to 22 year old students enrolled during the day varied over the four year period of analysis as indicated by graph #B-9. There was a slight decrease (from 65.4 percent to 63.8 percent of total) from 1978 to 1979, almost no variation from 1978 to 1979 (63.9 percent in 1979) and a sharp increase to 68.1 percent in 1981.

We enroll a higher percentage of 18 to 22 year old men than women during the day, as indicated by graph #B-10.

One of the most interesting analyses of this brief profile sample that I saw was an analysis of evening enrollment. Graph #B-8 clearly shows that there is a sharp decline that occurred from 1980 to 1981 in evening enrollment, but in terms of 18 to 22 year olds, we see a steady rise. I was surprised to learn that enrollment of 18 to 22 year olds, in the evening is substantially higher than I would have thought. Individuals 18 to 22 years of age went from 18.3 percent in 1978 to 24.4 percent in 1981. What this indicates is that, 1.) we not only enroll a high number of 18 to 22 year olds during the day, we enroll a substantial number in the evening; and 2.) as evening enrollment has declined in other age groups, it clearly rose in this age group.

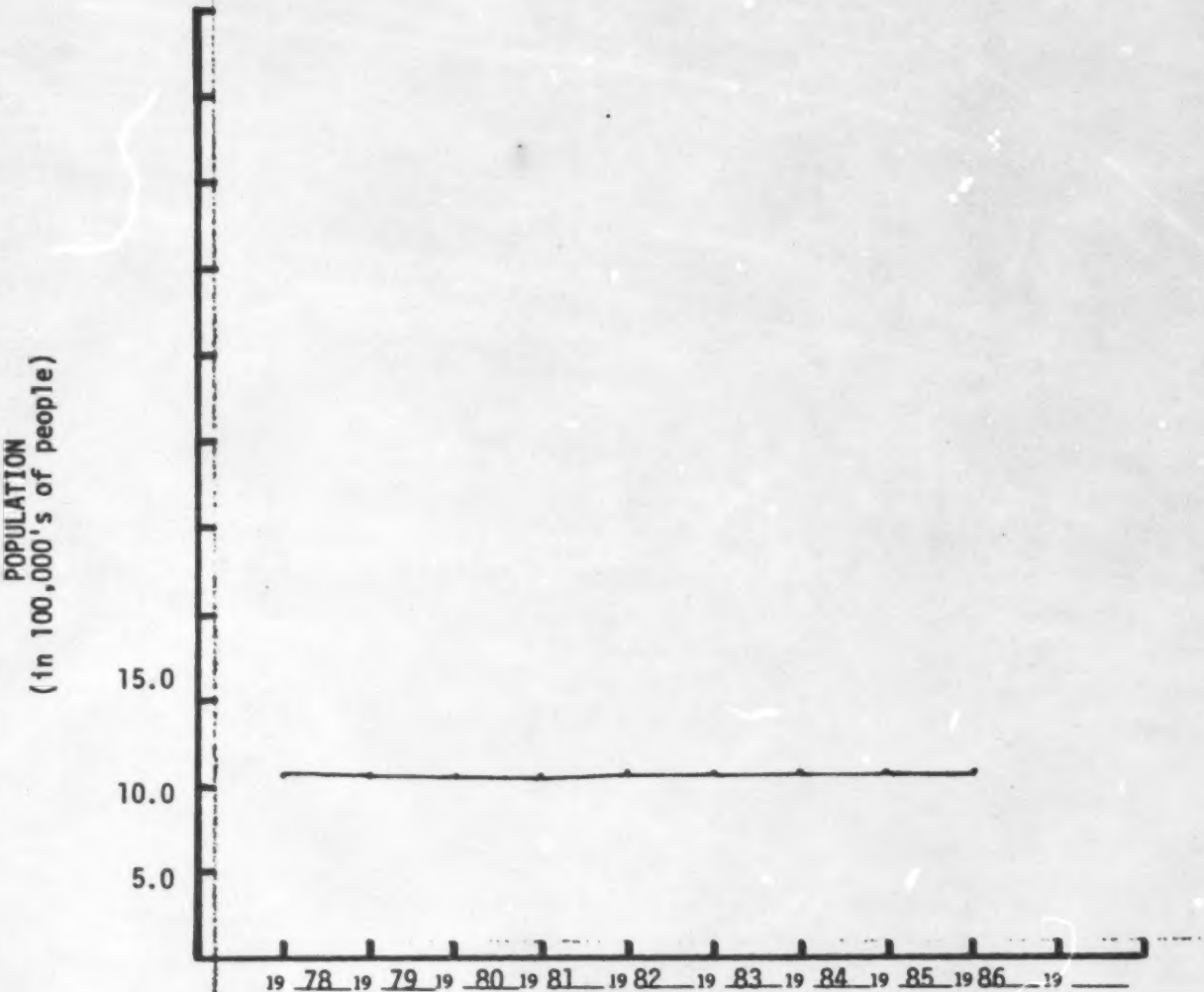
This information is very valuable to the Admissions Office Personnel at CCAC. As they recruit at local high schools, they can now begin pointing out that for those seniors who may wish to seek employment immediately upon graduation ought to consider the pursuit of a degree on a part-time basis in the evening. This approach may be an important way of stabilizing or increasing evening enrollment.

C. HOW DO A. and B. INTERRELATE: ENROLLMENT DEMOGRAPHY AS A PERCENTAGE OF COUNTY DEMOGRAPHY

The analyses of county residents, ages 18 and older enrolled in credit programs, in terms of total population in this age group, show us that total enrollment is extremely stable. As indicated by graph #C-1, the College served approximately 1.5 percent of the county adult population in 1978 and 1.51 percent in 1981. The forecast for 1982 through 1986 is 1.56 percent, 1.56 percent, 1.56 percent, 1.55 percent and 1.56 percent respectively.

Graph #C-2 and C-3 give us analyses of the numbers of 18 to 22 year old men and women being served as a percentage of the total population in this age group. It seems to clearly indicate that the College had the edge in enrolling 18 to 22 year olds as compared to colleges and universities. The College saw a change of a 6.1 percent to an 8.4 percent rate of enrolled men from 1980 to 1981 and from a 5.9 percent to a 7.8 percent rate for women during the same time period. I would surmise that colleges and universities which recruit students from Allegheny County high schools saw a decrease in the number of students they enrolled, unless of course, we are seeing a higher percentage of this population attend college overall.

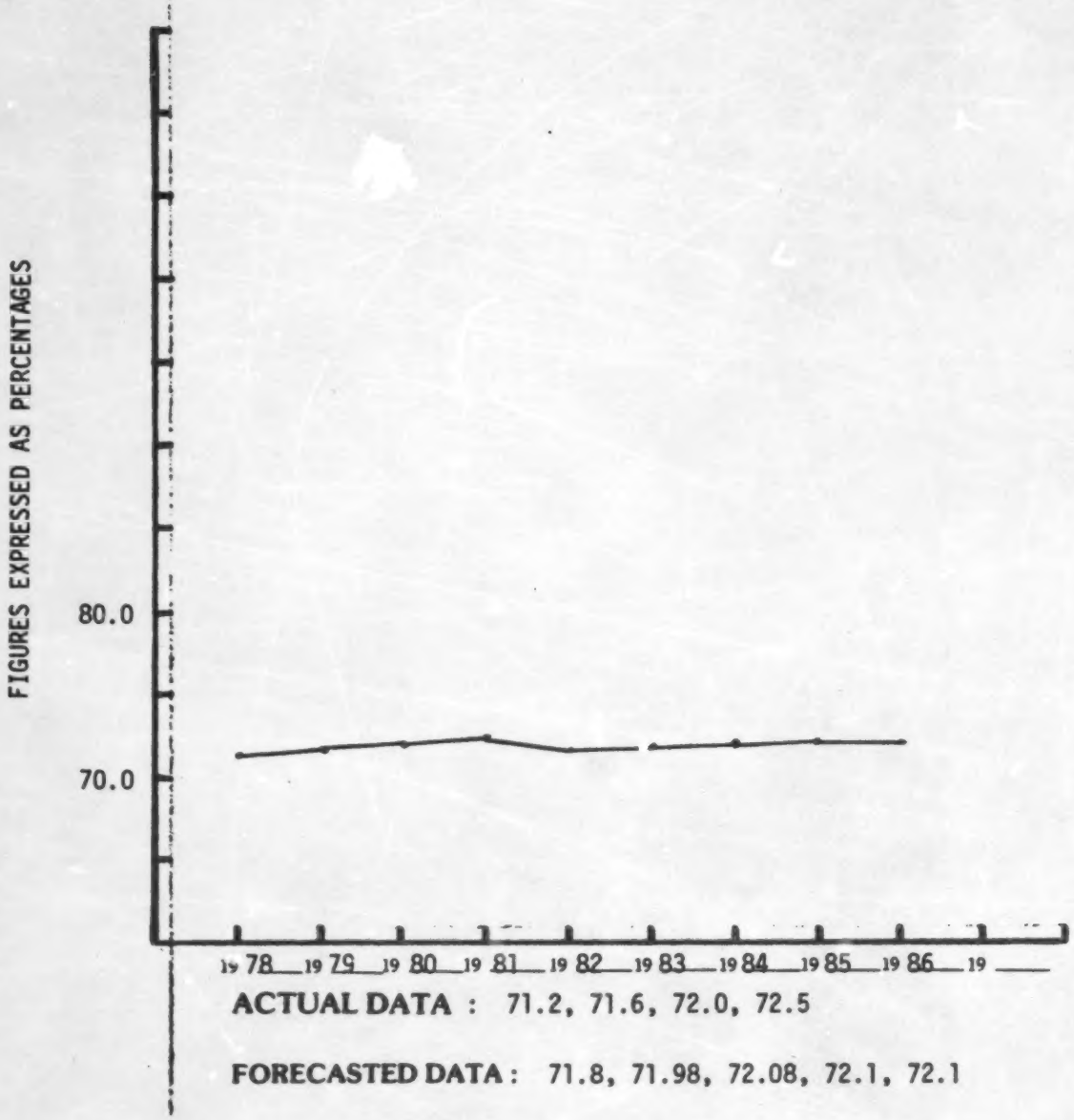
PROFILE Allegheny County, Pa **INDICATOR BEING STUDIED** Population, Ages 18 and older and older



ACTUAL DATA : 10.55, 10.50, 10.45, 10.40

FORECASTED DATA : 10.47, 10.46, 10.45, 10.44, 10.5

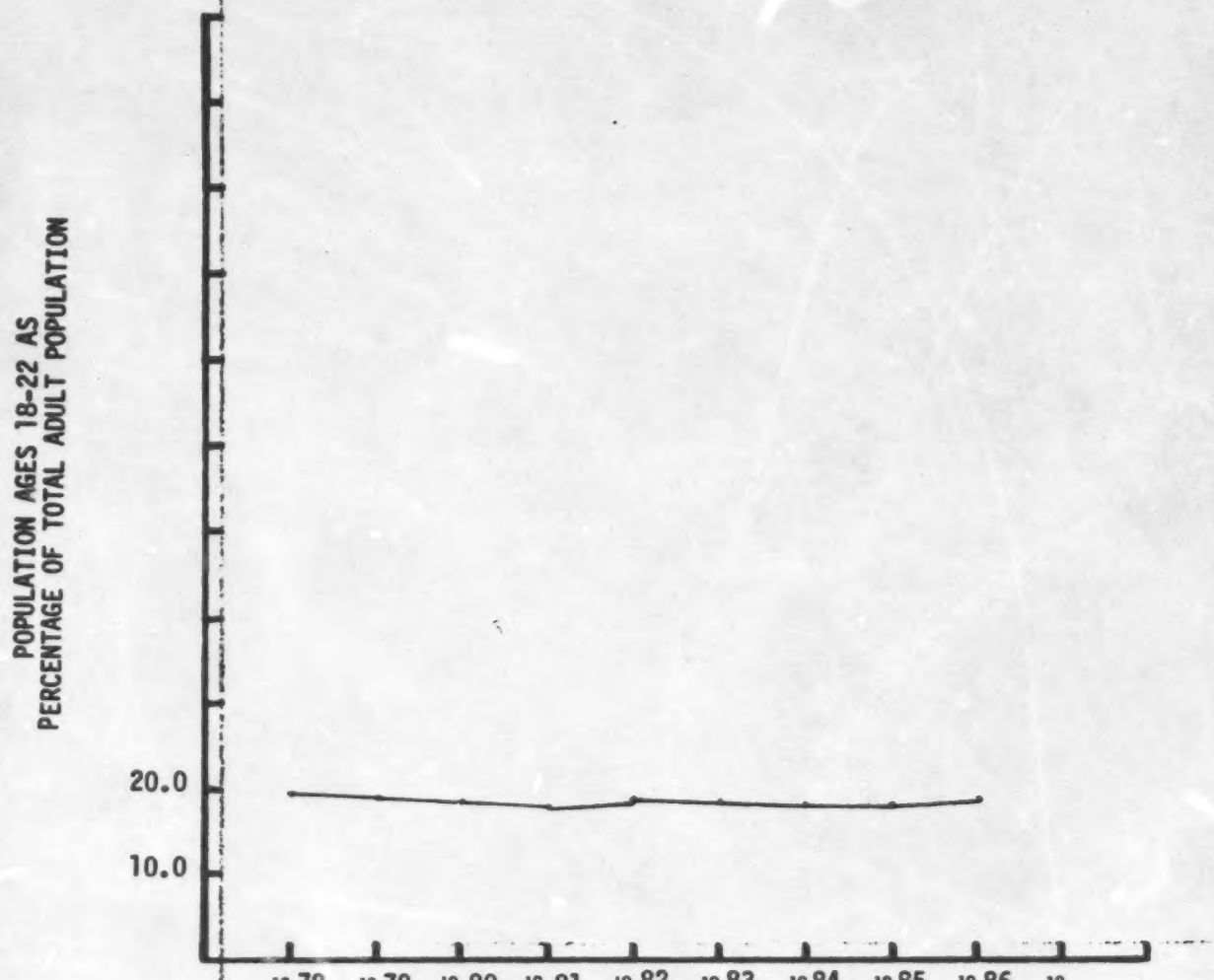
PROFILE Allegheny County, Pa. **INDICATOR BEING STUDIED** Population age 18 and older, as percentage of total population



ACTUAL DATA : 71.2, 71.6, 72.0, 72.5

FORECASTED DATA : 71.8, 71.98, 72.08, 72.1, 72.1

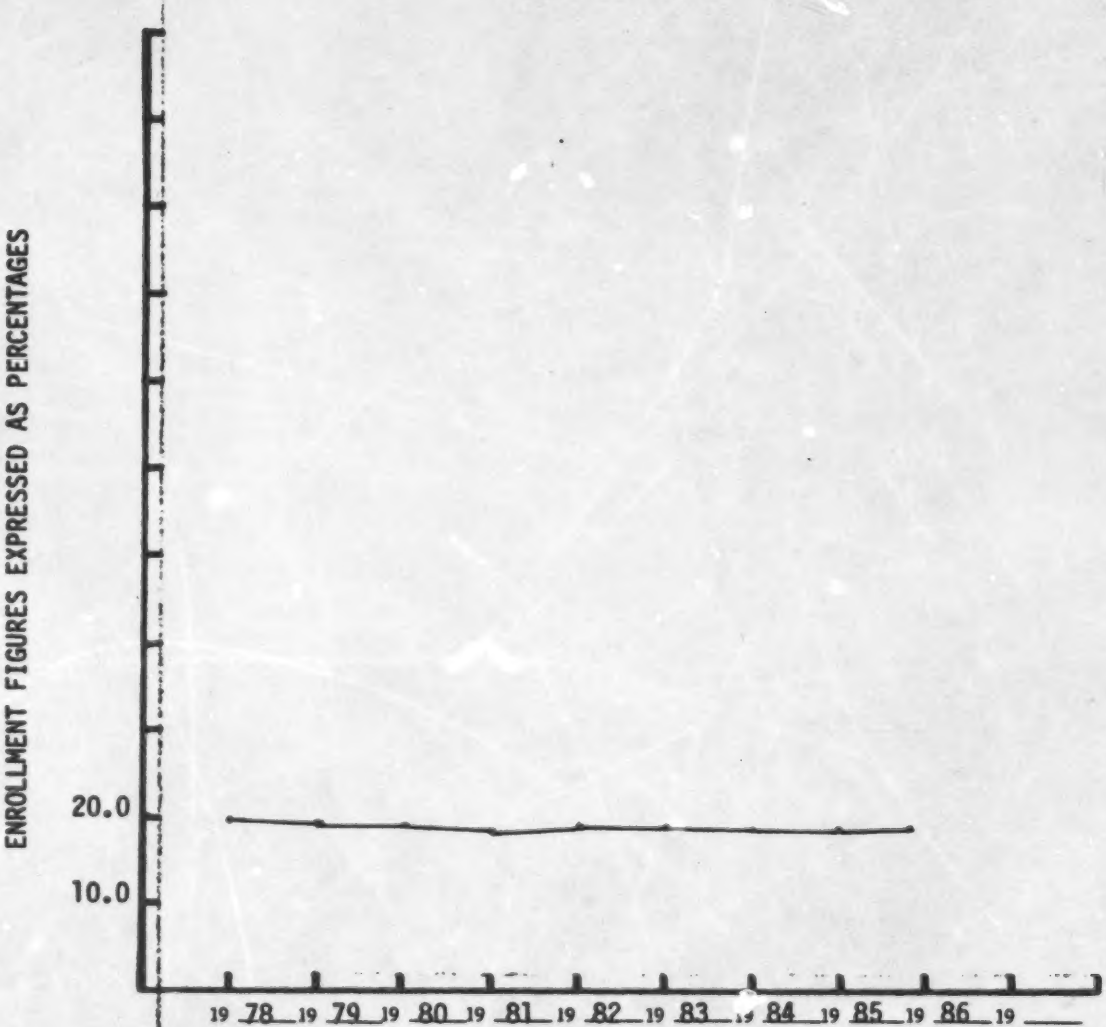
PROFILE Allegheny County **INDICATOR BEING STUDIED** Population, age 18-22 as percentage of total adult population (18 years and older)



ACTUAL DATA: 9.5, 9.3, 9.1, 8.9

FORECASTED DATA: 9.2, 9.1, 9.08, 9.07, 9.11

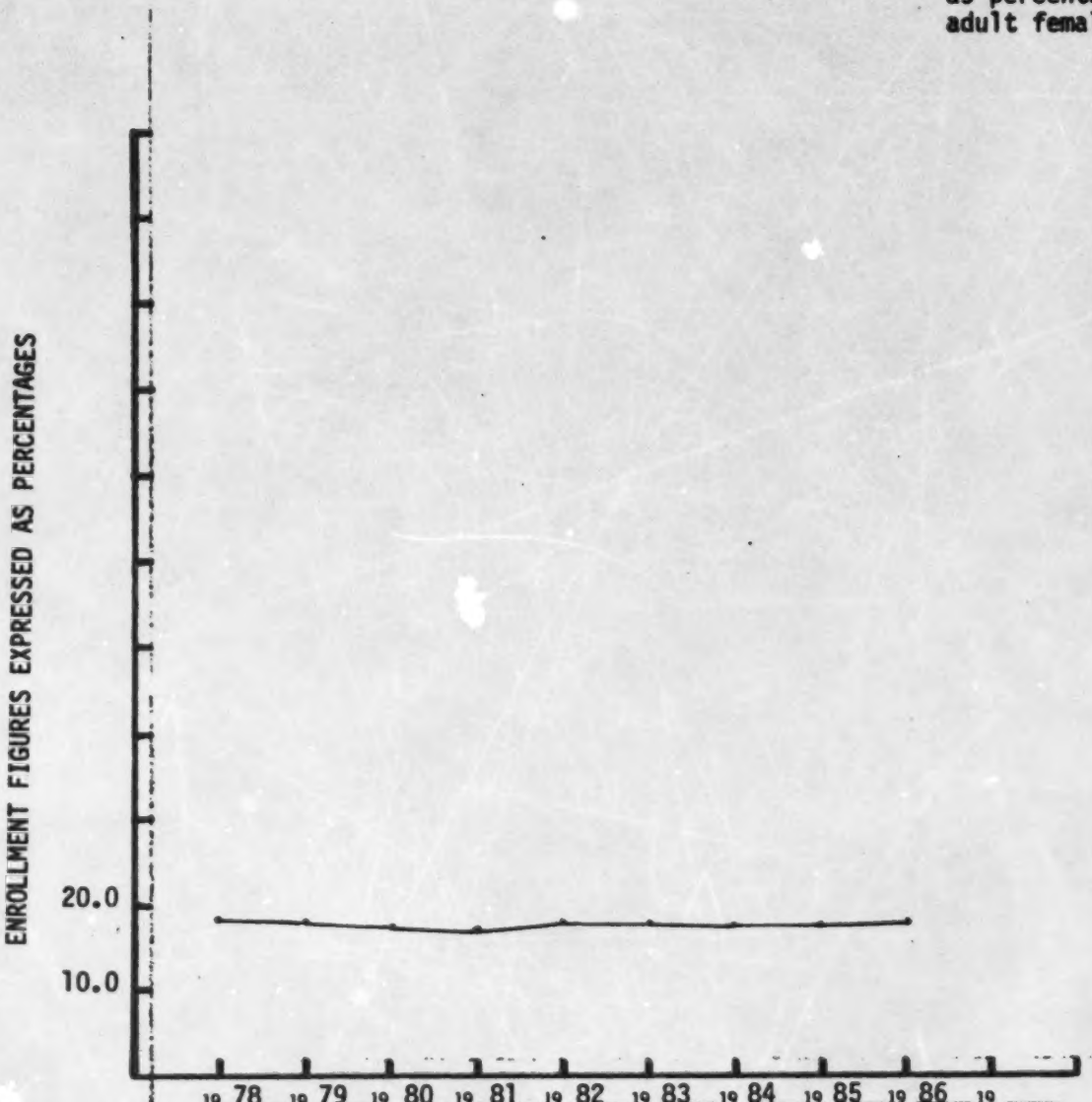
PROFILE Allegheny County **INDICATOR BEING STUDIED** Males, Ages 18-22, as percentage of all adult males.



ACTUAL DATA: 9.9, 9.7, 9.6, 9.4

FORECASTED DATA 9.7, 9.6, 9.58, 9.57, 9.6

PROFILE Allegheny County **INDICATOR BEING STUDIED** Females, Ages 18-22 as percentage of all adult females

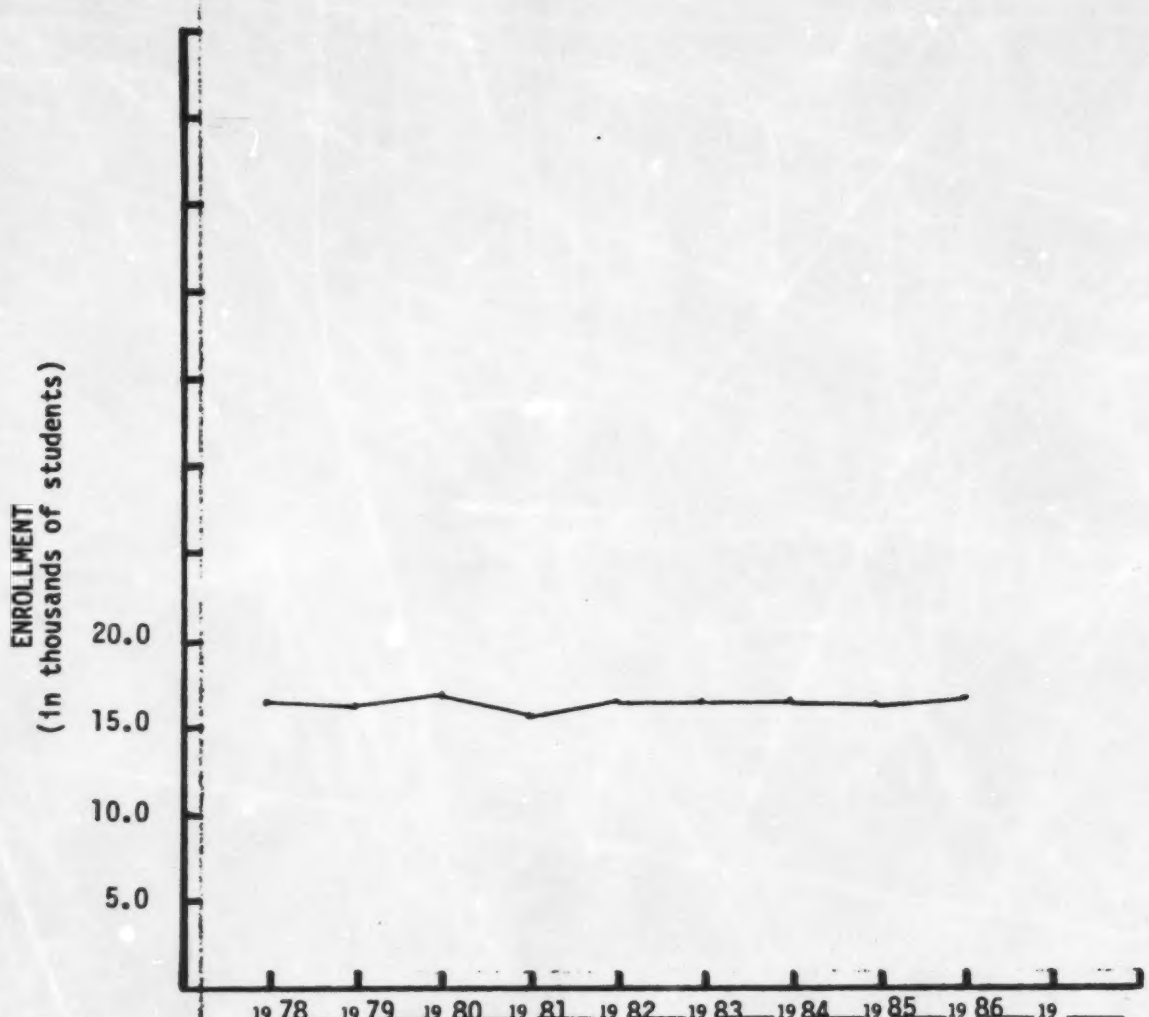


ACTUAL DATA 9.2, 9.0, 8.7, 8.5

FORECASTED DATA 8.9, 8.8, 8.7, 8.7, 8.8

PROFILE Credit Enrollment
CCAC, Systemwide
Fall Semesters

INDICATOR BEING STUDIED Total enrollment for
Fall Semesters

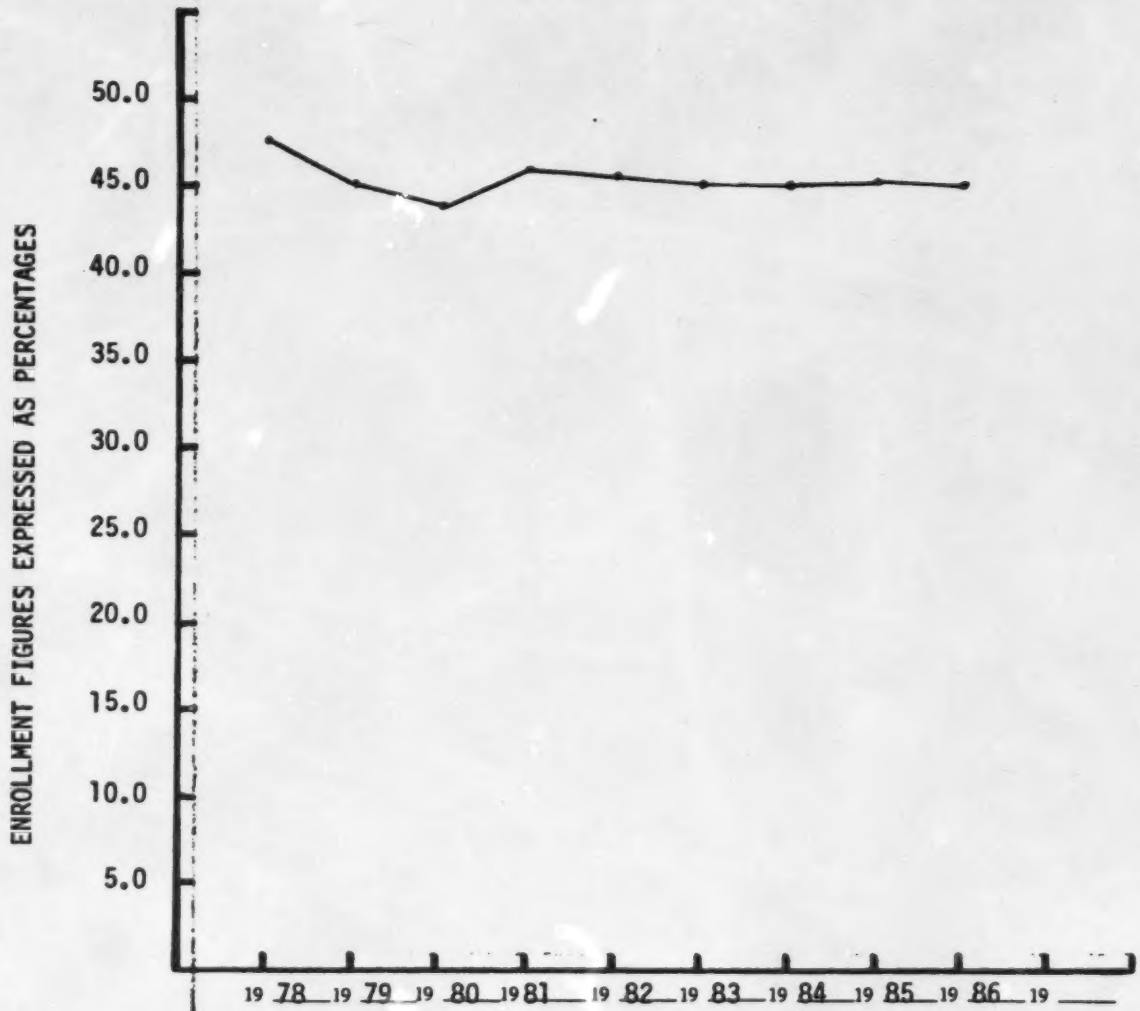


ACTUAL DATA: 16.53, 16.23, 16.78, 15.66

FORECASTED DATA: 16.3, 16.24, 16.25, 16.11, 16.27

PROFILE CREDIT ENROLLMENT
CCAC, Systemwide
Fall Semesters

INDICATOR BEING STUDIED Males enrolled as percentage of total enrollment

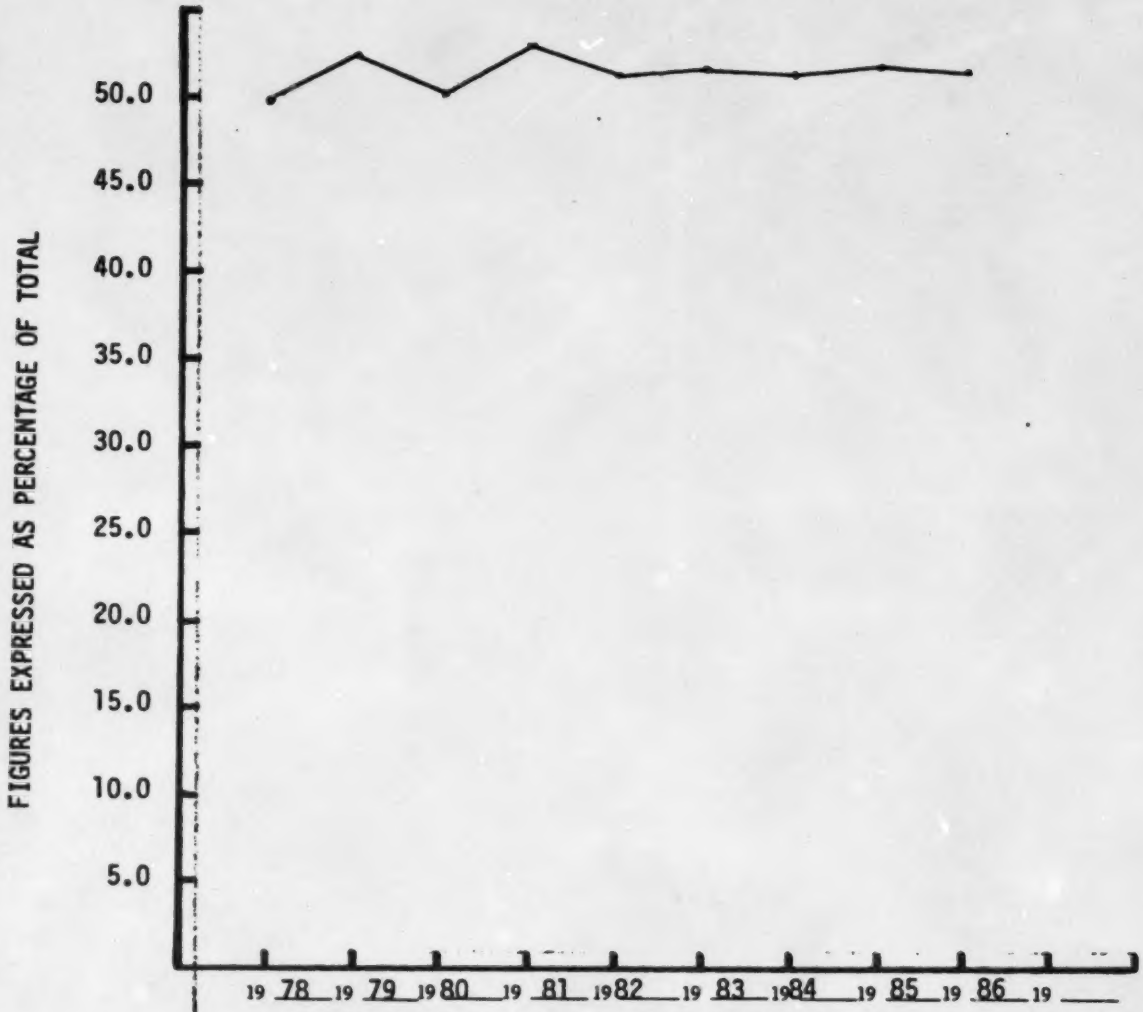


ACTUAL DATA : 47.8, 45.2, 44.0, 46.1

FORECASTED DATA : 45.8, 45.4, 45.3, 45.6, 45.5

PROFILE Credit Enrollment
CCAC, Systemwide
Fall Semesters

INDICATOR BEING STUDIED Females enrolled as percentage of total enrollment

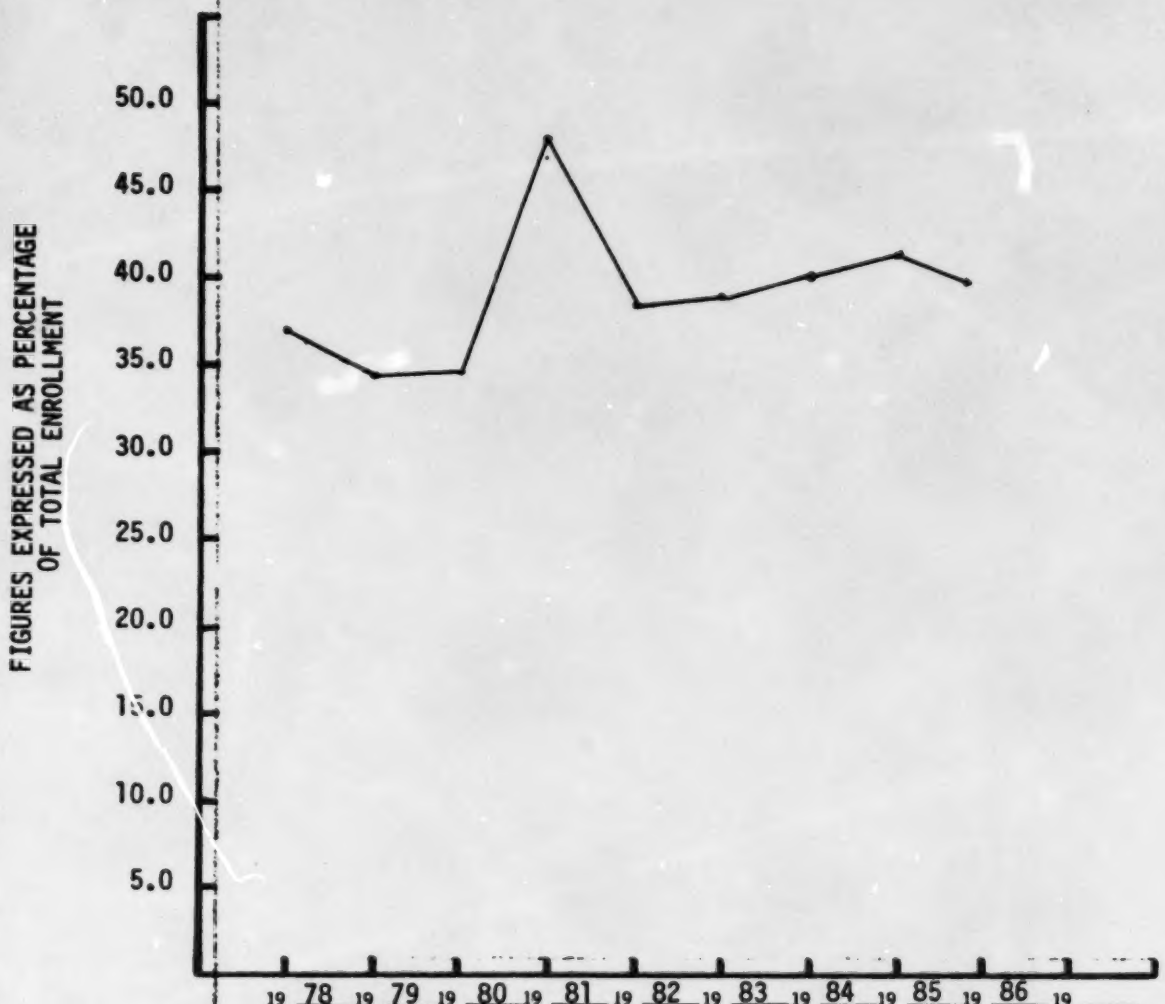


ACTUAL DATA : 50.0, 52.5, 50.4, 53.1

FORECASTED DATA : 51.5, 51.9, 51.7, 52.0, 51.8

PROFILE Credit Enrollment
CCAC, Systemwide
Fall Semesters

INDICATOR BEING STUDIED Students enrolled, Ages 18-22 expressed as percentage of total enrollment

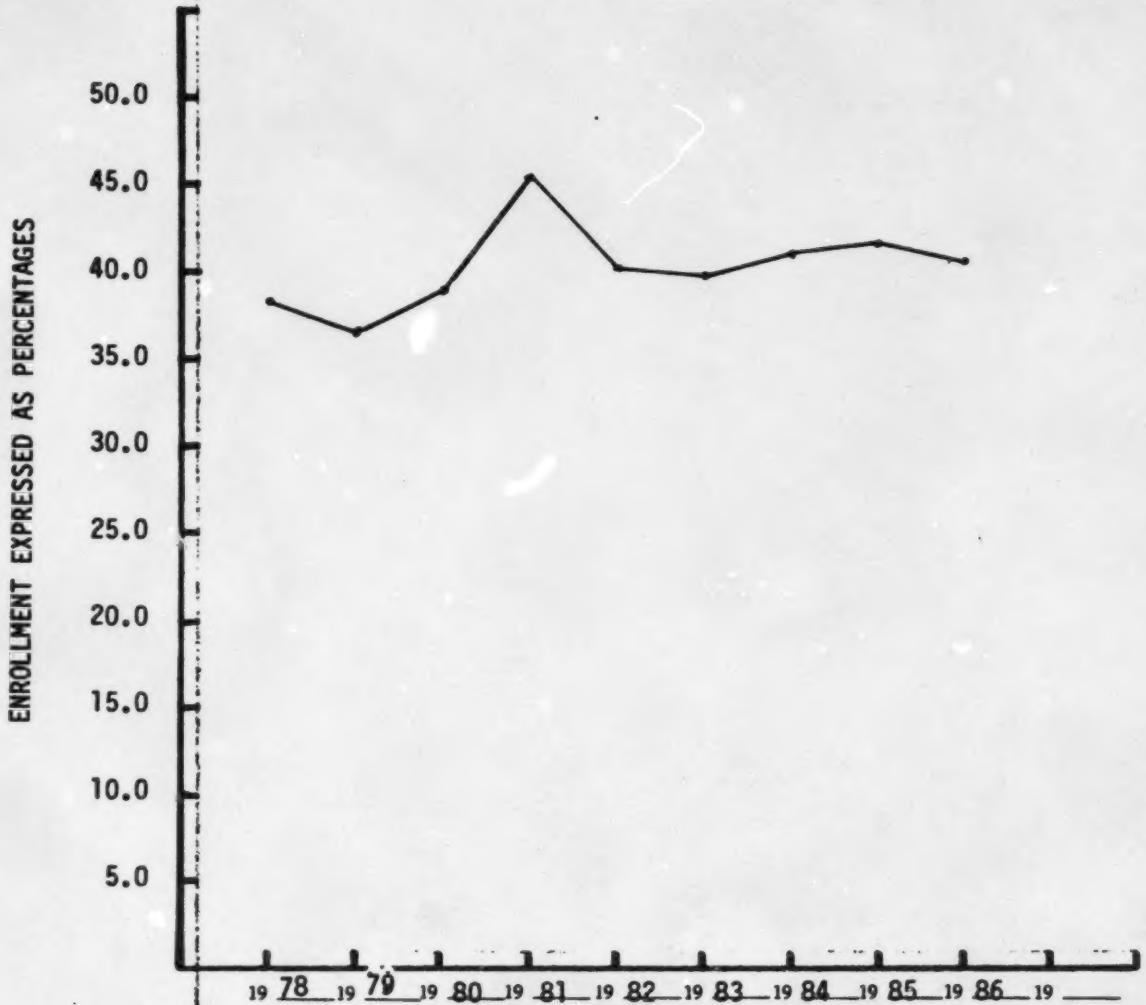


ACTUAL DATA : 37.0, 34.5, 34.6, 48.1

FORECASTED DATA: 38.6, 39.0, 40.1, 41.45, 39.79

PROFILE Credit Enrollment
CCAC, Systemwide
Fall Semesters

INDICATOR BEING STUDIED Males, Age 18-22 as a percentage of all males enrolled

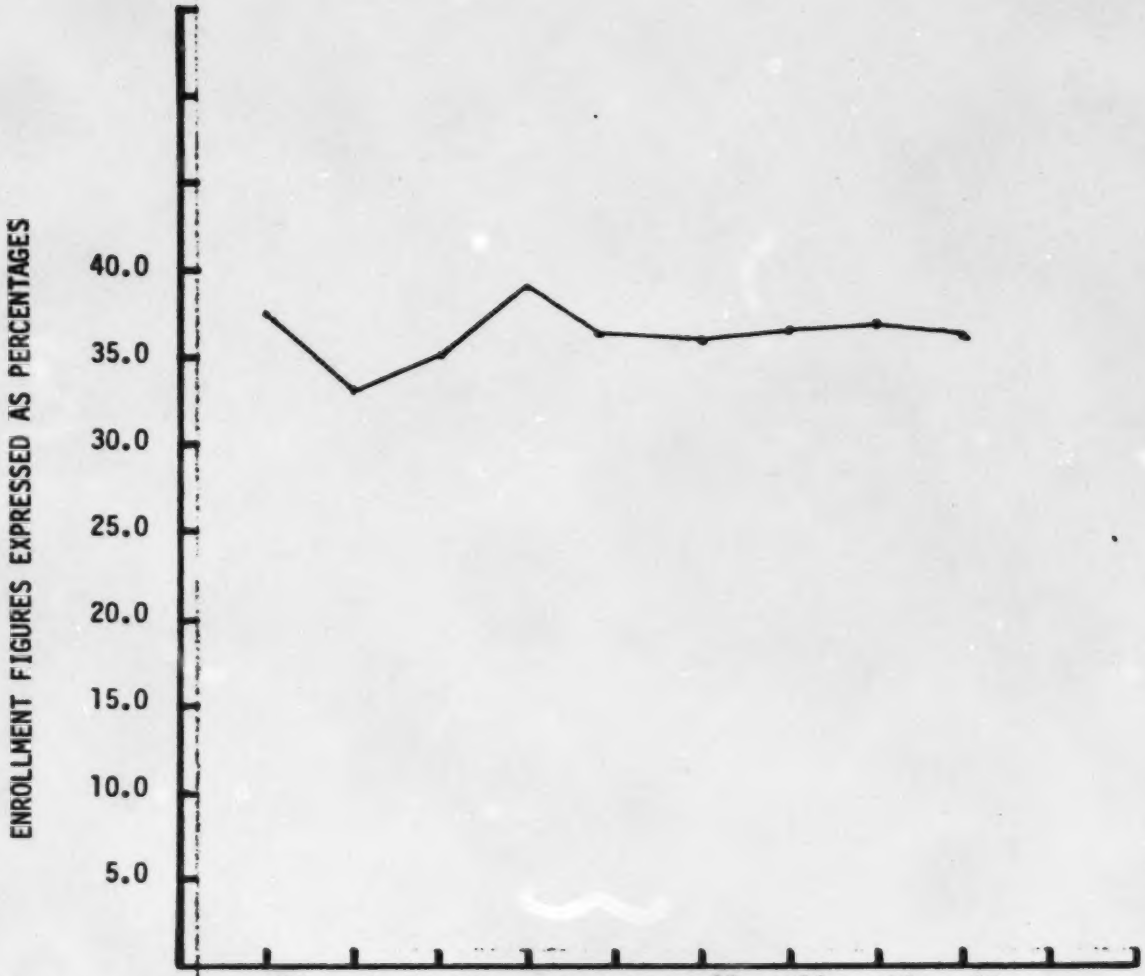


ACTUAL DATA: 38.6, 36.9, 39.2, 45.8

FORECASTED DATA: 40.1, 40.5, 41.4, 42.0, 41.0

PROFILE Credit Enrollment
CCAC, Systemwide
Fall Semesters

INDICATOR BEING STUDIED Females, Ages 18-22 as a percentage of all females enrolled

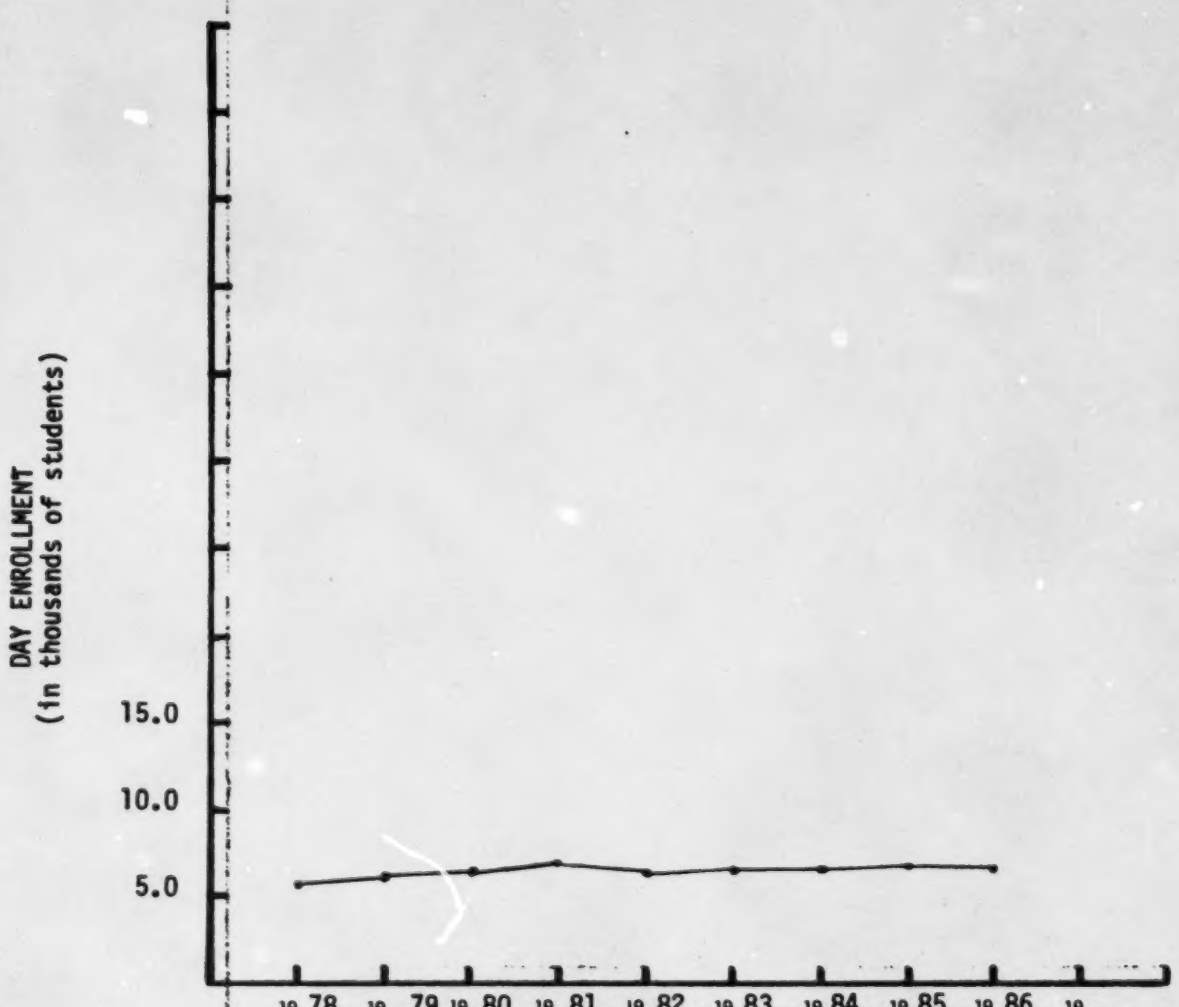


ACTUAL DATA: 37.7, 33.9, 35.1, 39.1

FORECASTED DATA: 36.5, 36.2, 36.7, 37.1, 36.6

PROFILE Credit Enrollment
CCAC, Systemwide
Fall Semesters

INDICATOR BEING STUDIED Total Day Enrollment

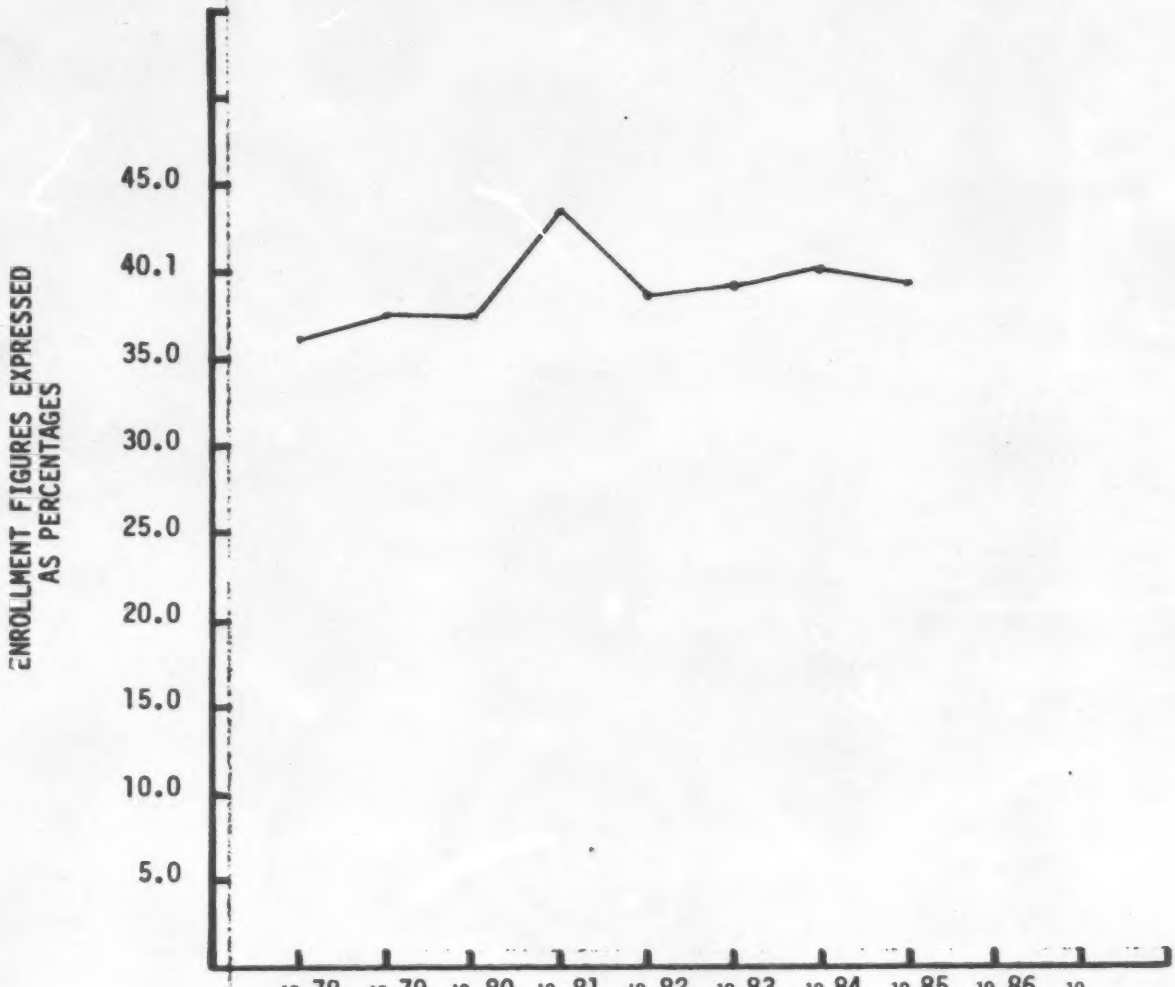


ACTUAL DATA: 5.98, 6.10, 6.29, 6.81

FORECASTED DATA : 6.3, 6.38, 6.45, 6.49, 6.41

PROFILE Credit Enrollment
CCAC, Systemwide
Fall Semesters

INDICATOR BEING STUDIED Day Enrollment expressed as a percentage of total enrollment

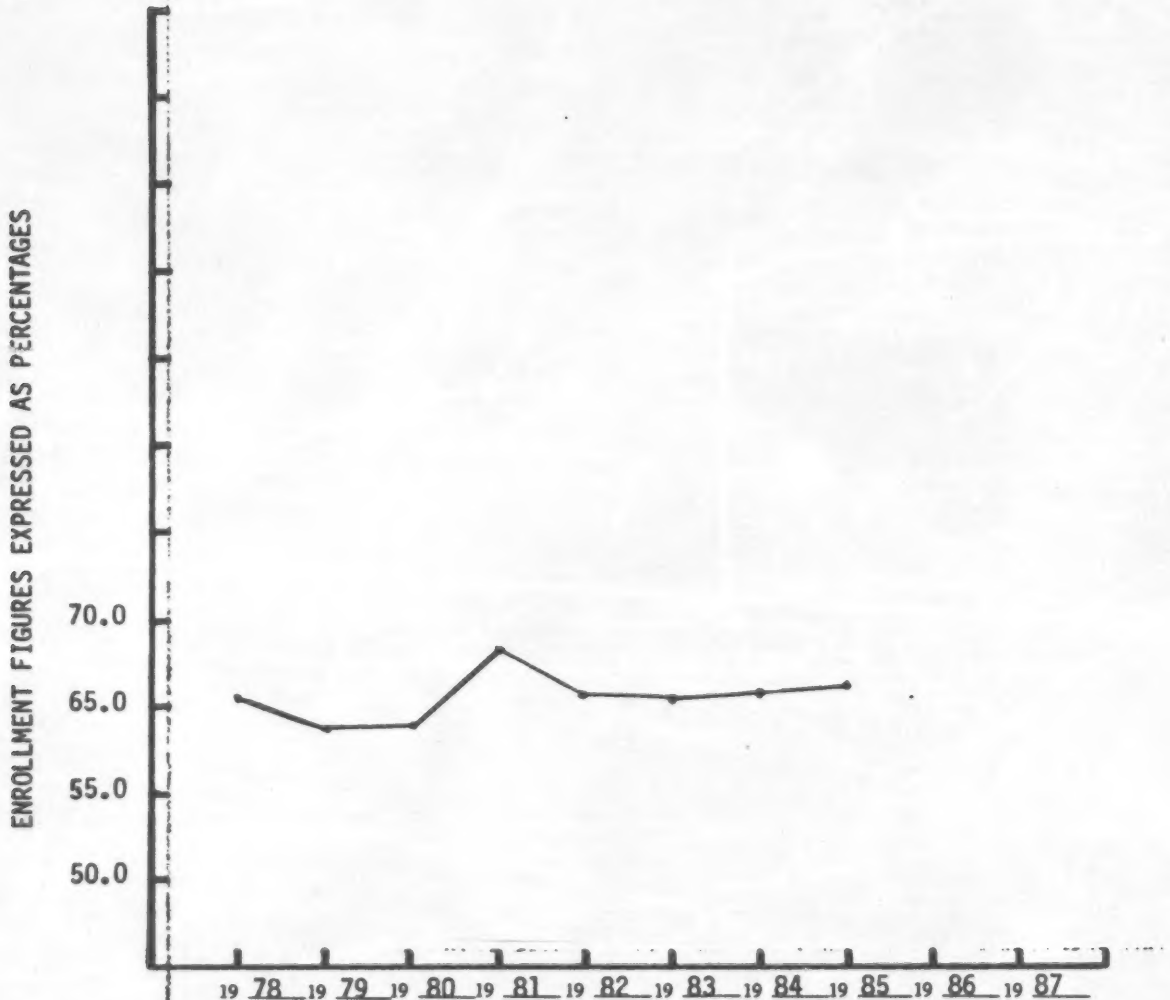


ACTUAL DATA: 36.2, 37.6, 37.5, 43.5

FORECASTED DATA: 38.7, 39.3, 39.8, 40.3, 39.5

PROFILE Credit Enrollment
CCAC, Systemwide
Fall Semesters

INDICATOR BEING STUDIED Students, Ages 18-22 enrolled during day, as a percentage of total day enrollment

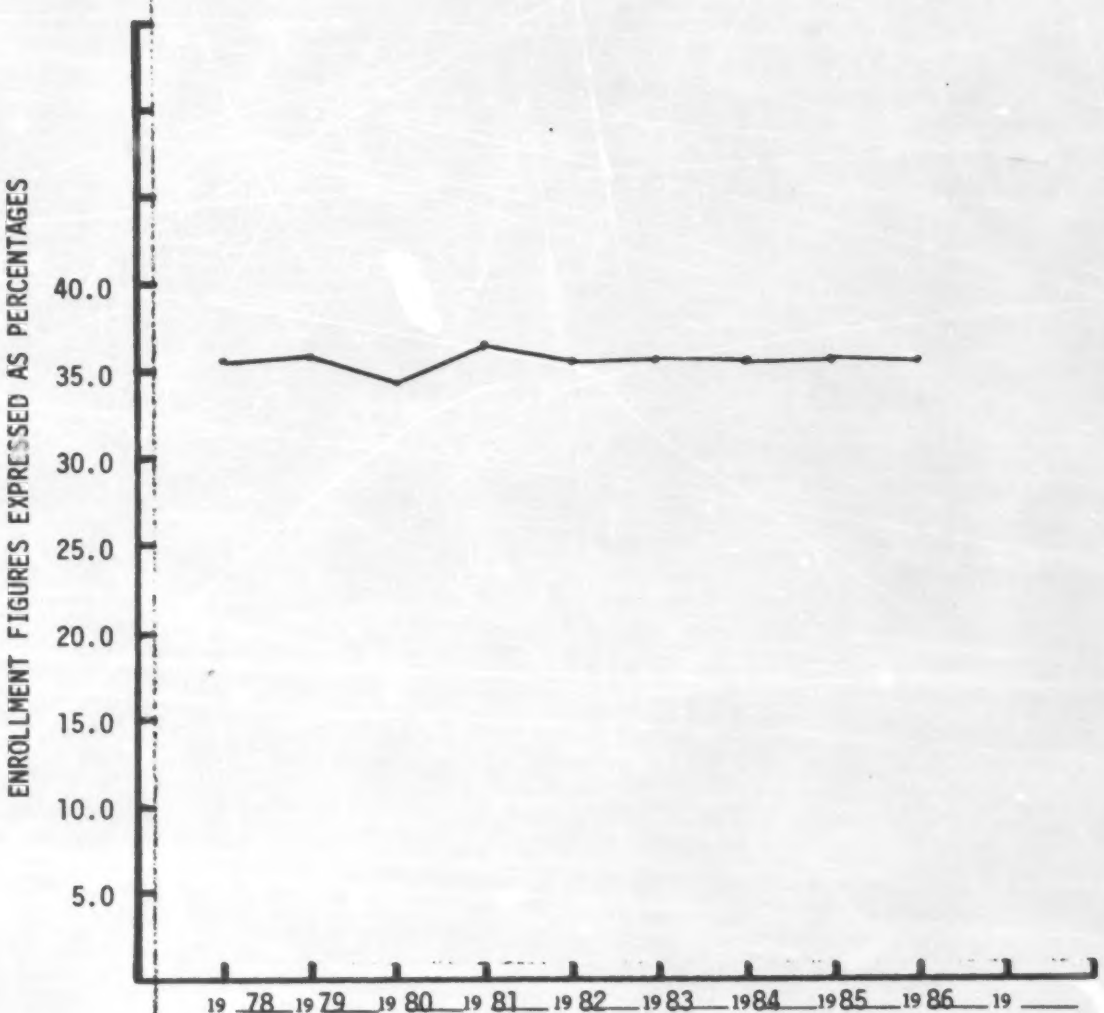


ACTUAL DATA : 65.4, 63.8, 63.9, 68.1

FORECASTED DATA: 65.3, 65.28, 65.6, 66.0

PROFILE Credit Enrollment
CCAC, Systemwide
Fall Semesters

INDICATOR BEING STUDIED Females, Age 18-22 enrolled in day courses in terms of total day enrollment

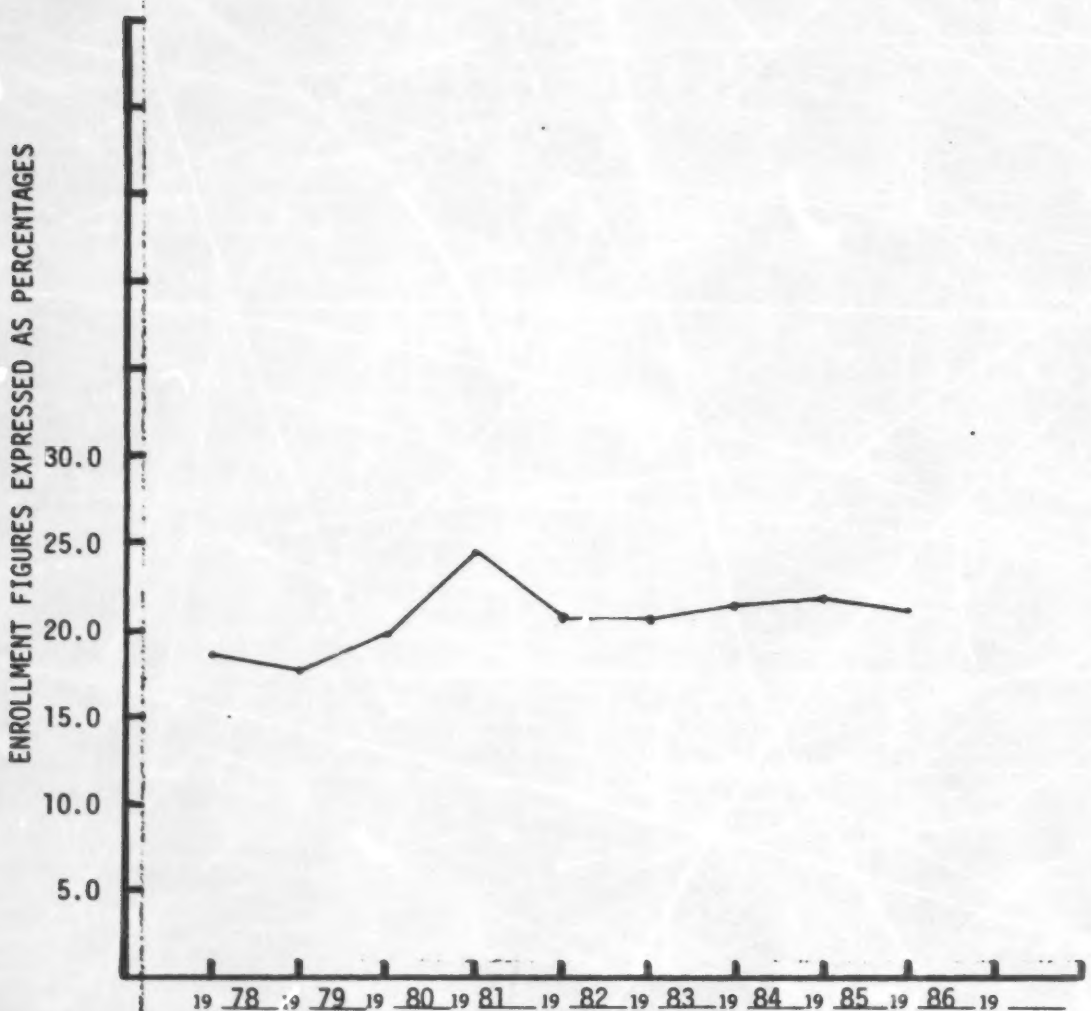


ACTUAL DATA 35.6, 35.9, 34.2, 36.3

FORECASTED DATA 35.5, 35.48, 35.37, 35.7, 35.5

PROFILE Credit Enrollment
CCAC, Systemwide
Fall Semesters

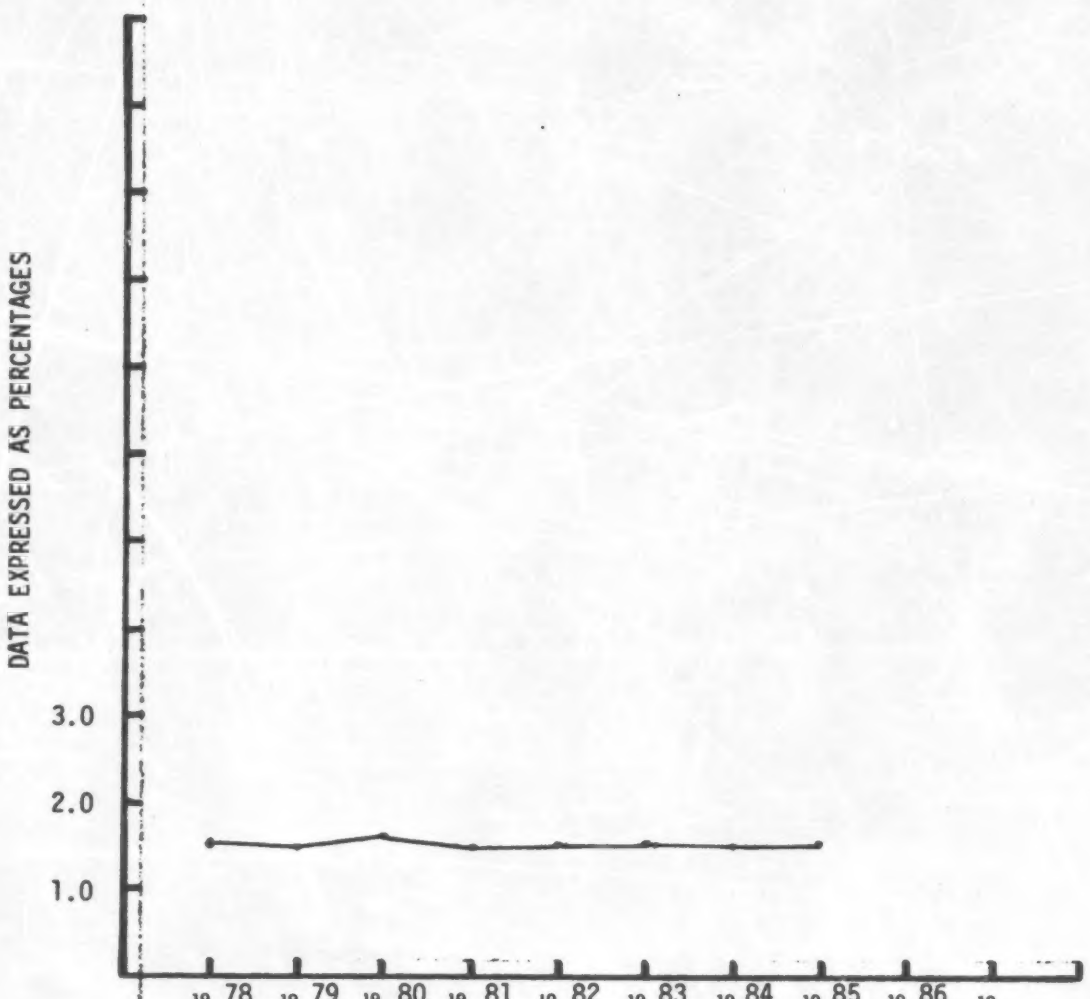
INDICATOR BEING STUDIED Students Ages 18-22 enrolled during evening as percentage of total evening program



ACTUAL DATA : 18.3, 17.7, 19.9, 24.4

FORECASTED DATA : 20.7, 20.68, 21.42, 21.8, 21.15

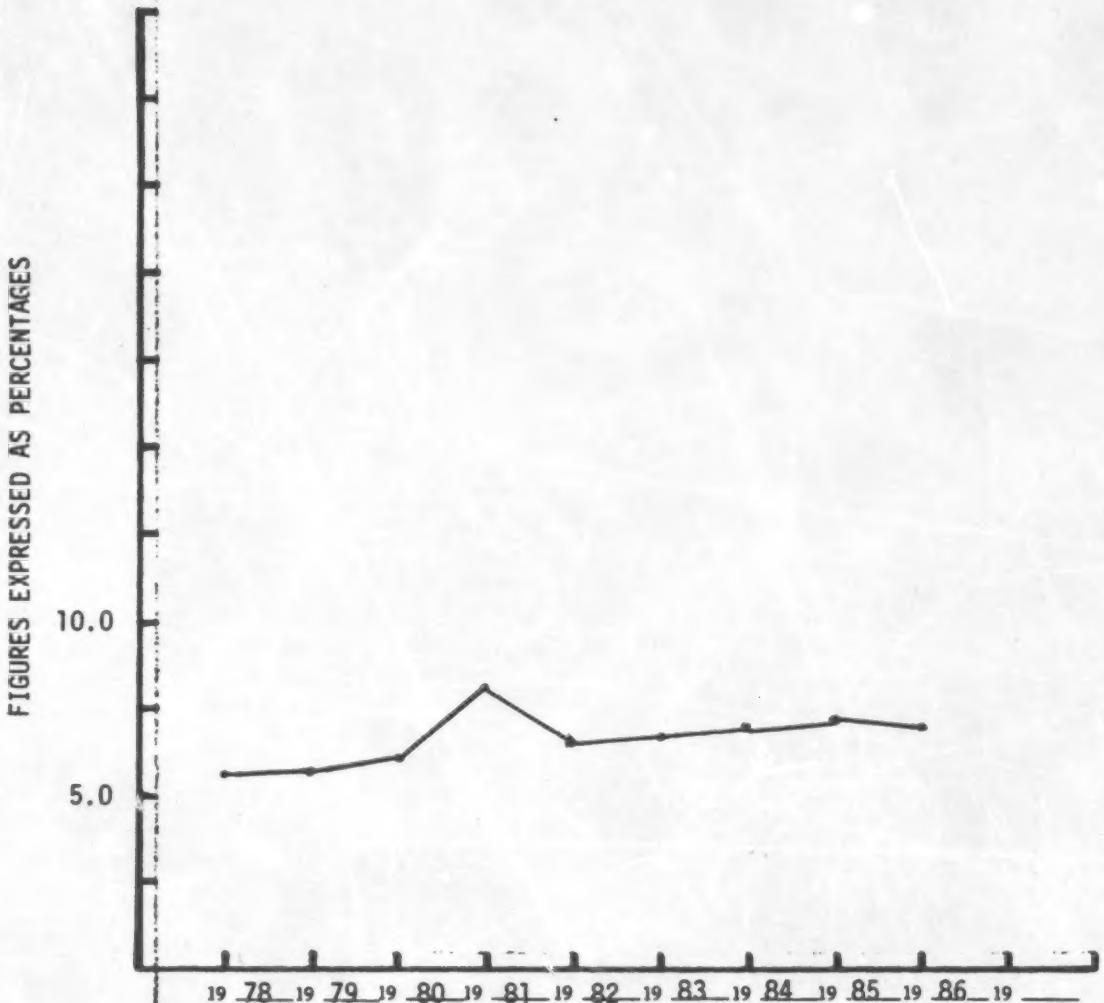
PROFILE Enrollment in terms of County Demography **INDICATOR BEING STUDIED** Total Enrollment in terms of total population (Ages 18 and older)



ACTUAL DATA : 1.57, 1.55, 1.61, 1.51

FORECASTED DATA : 1.56, 1.56, 1.56, 1.55, 1.56

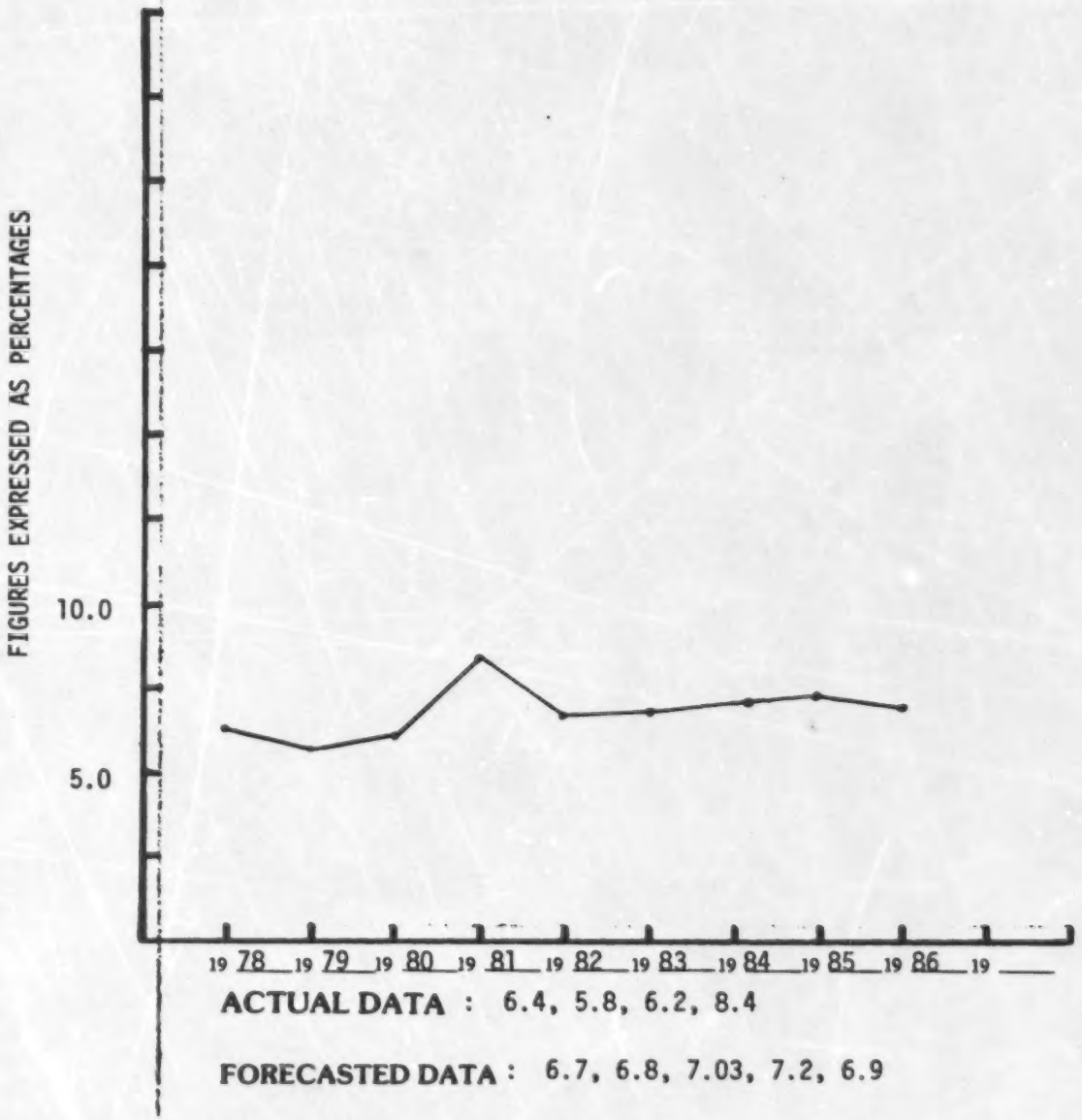
PROFILE Enrollment in terms of County Demography **INDICATOR BEING STUDIED** Students, ages 18-22 in terms of county population, ages 18-22



ACTUAL DATA : 5.7, 5.73, 6.1, 8.1

FORECASTED DATA : 6.41, 6.59, 6.8, 7.0, 6.7

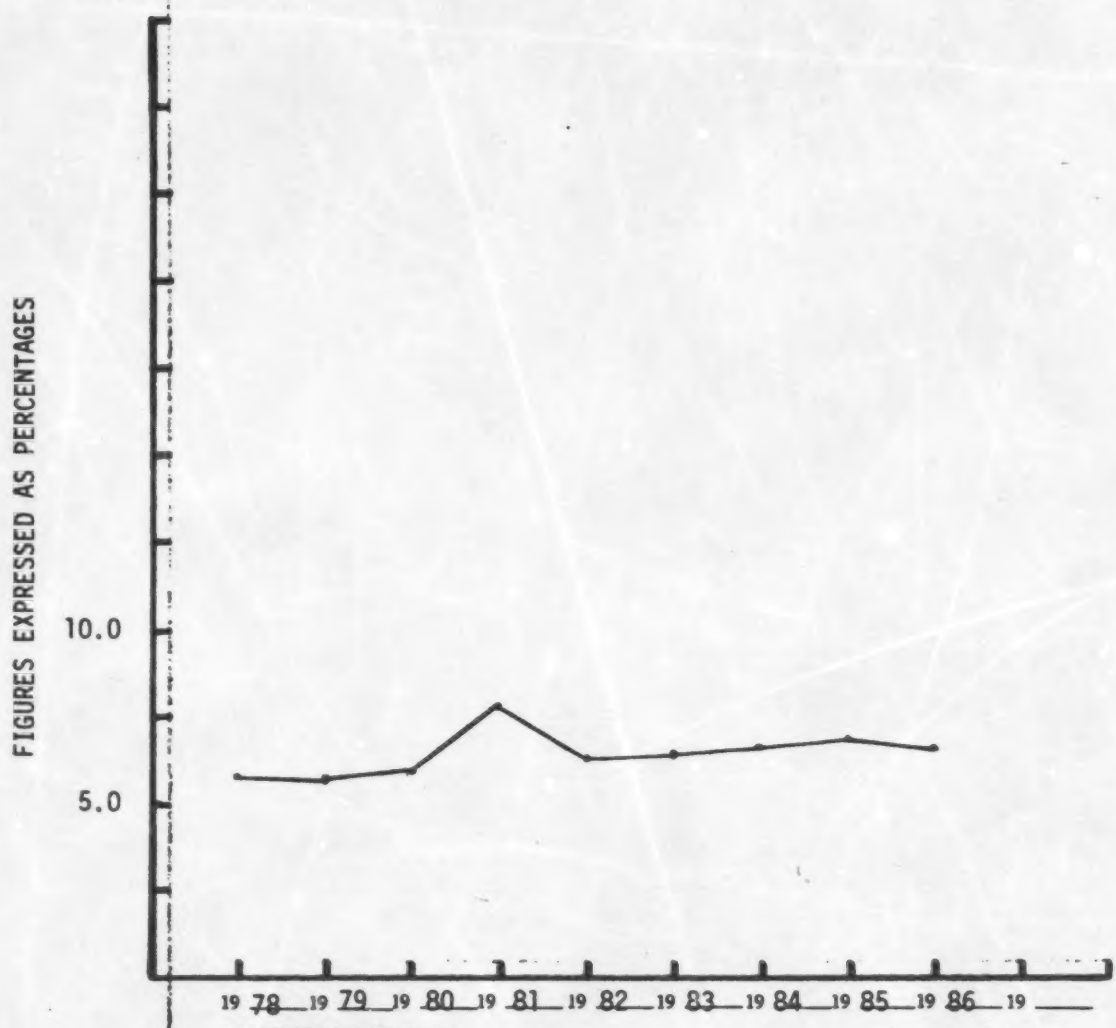
PROFILE Enrollment in terms of County Demography **INDICATOR BEING STUDIED** Male students, 18-22 years of age as a percentage of total male population, ages 18-22



ACTUAL DATA : 6.4, 5.8, 6.2, 8.4

FORECASTED DATA : 6.7, 6.8, 7.03, 7.2, 6.9

PROFILE Enrollment in terms of County Demography **INDICATOR BEING STUDIED** Female students, 18-22 years of age as a percentage of total female population, ages 18-22



ACTUAL DATA : 5.8, 5.7, 5.9, 7.8,

FORECASTED DATA : 6.3, 6.4, 6.6, 6.8, 6.5

VIII. CONCLUDING REMARKS

The CCAC analysis was a sample of how a profile might begin to look. This is by no means a well-developed profile but rather a small example of how one might begin to develop a profile. We do have an indepth understanding of student enrollment, ages 18 to 22, and how it relates to both total enrollment and county demography. We should now begin to look at some of the other segments of the profile, including other age groups, area/departmental course offerings, how enrollment varies in geographic areas being served, the racial context, etc.

The implications of the market profile can be far reaching. The information analyzed in terms of credit enrollment is valuable not just in terms of recruitment and program planning for the admissions office and various faculty departments, but also for student service operations in their program planning which would include student activities, counseling services, advisement and daycare to name a few. The information could also be valuable to library staffs for scheduling purposes and for offering special programs. It is also valuable for college personnel who schedule tutorial services and developmental programs. This is not information that outlines issues for one department, by any means.

Computer programs can be made available to make the calculations which I explained. Basic and Fortran programs can be written to calculate the math for the analysis. For micro-computer owners, the packaged program titled Visiplot can be utilized to plot graphs with the data.

If your computer system has purchased the Statistical Package for the Social Sciences (SPSS) software, an update supplement to that package is now available. It's entitled SPSS Update 7-9 and includes the "Box-Jenkins Analysis of Time Series" which will forecast time series values and plot the data. In addition, they have a new graphics package that is compatable, with at least IBM Systems and is being adapted for other large systems. It should be available within the next year.

If anyone is interested in the computer support for the analyses which I outlined, please check with me for further information.

VIIII. APPENDIX

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MAR 25 1983